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ABSTRACT

This second semester laboratory manual provides activities for junior high school students which reinforce construction concepts presented in the textbook (VT 014 241) and the accompanying teacher's guide (VT 014 244). Each of the 81 activities includes a stated objective and procedures for carrying out the activity with drawings, charts, and pictures provided where necessary. Sample topics include: (1) Installing Electrical Communicator's Systems, (2) Enclosing Exterior Walls, (3) Planning the Living Space, (4) Building the Substructure, (5) City and Regional Planning Factors, and (6) Managing Community Development. The manual for the first semester is available as VT 014 242. Other related documents are available as VT 014 088 and VT 014 238-VT 014 240. (GEB)

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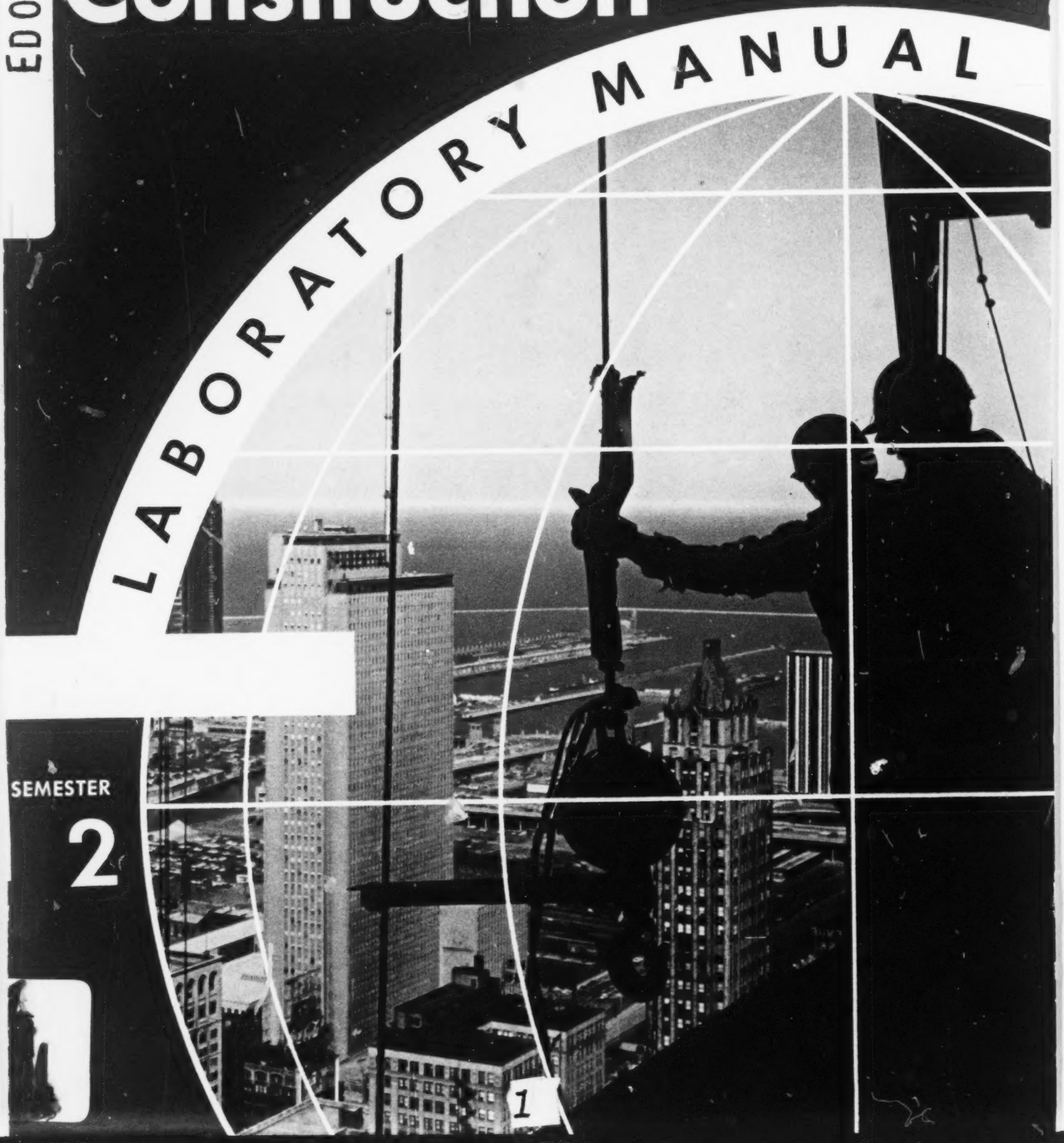
Industrial Arts Curriculum Project

THE WORLD OF Construction

LABORATORY MANUAL



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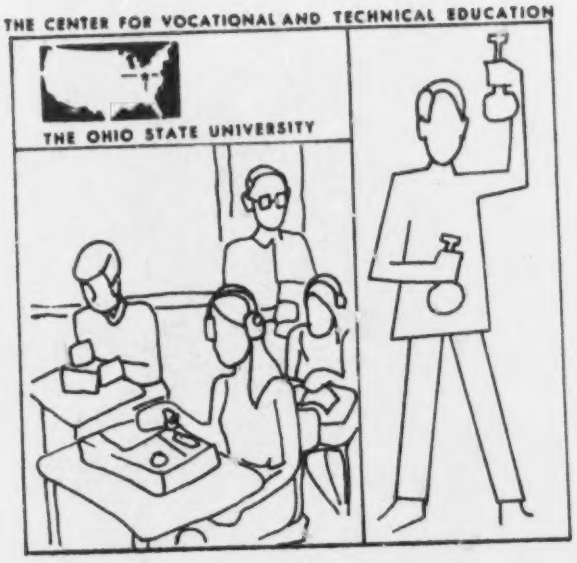

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THE WORLD OF Construction

LABORATORY MANUAL

SEMESTER 2

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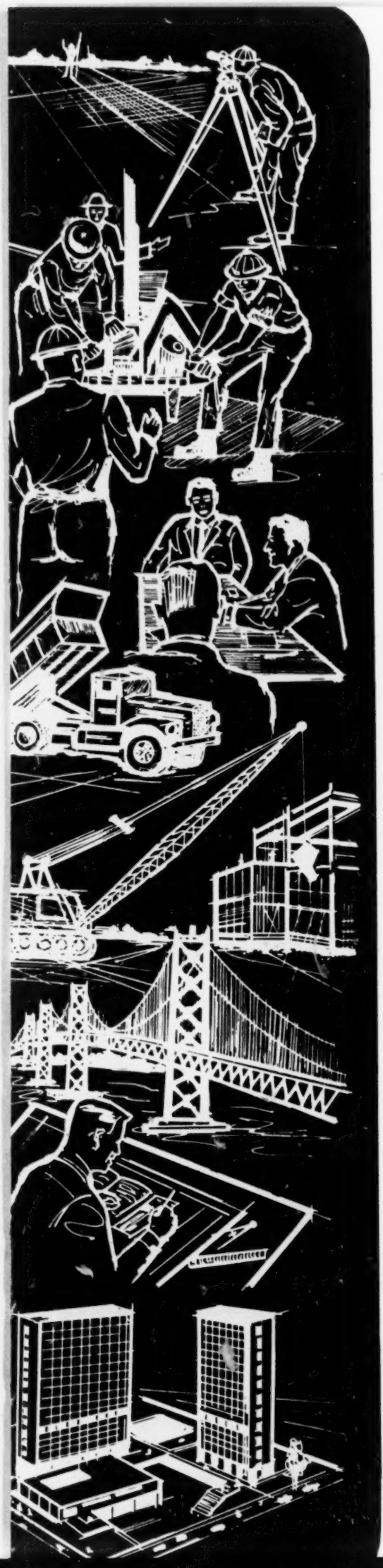

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*The activity numbers are the same as the reading assignment numbers to which they relate. Some readings are followed by activities which require more than one day to complete. Each of these activities is identified by a number and a letter.

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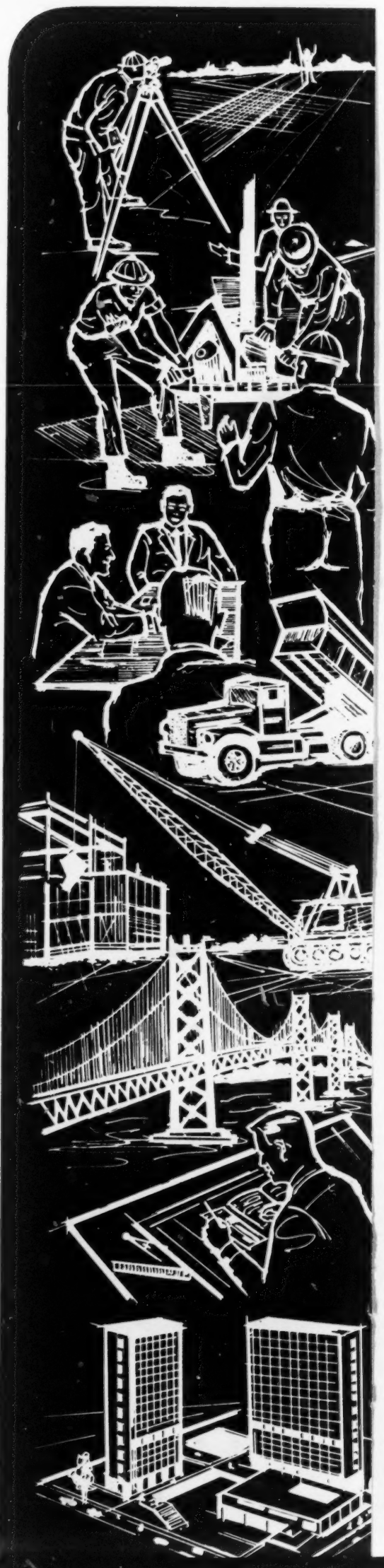

ACTIVITY 49A

Installing Heating, Cooling, and Ventilating Systems

Problem

Objective

Using proper equipment and supplies:

a. Lay out, cut, and bend three pieces of sheet metal to form a boot, boot cap, and round duct.
b. Seam the ends of a formed duct and boot.

Equipment (Group of 5)

1 framing square
1 awl
1 pr. dividers
1 cold chisel
1 pr. aviation snips
1 pan brake *or* hand seamer
1 $\frac{5}{16}$" hand groover
1 tinner's setting hammer *or* wooden mallet
1 center punch
1 slip roll, round stake *or* piece of pipe

Supplies (Group of 5)

1 set 28 gauge sheet metal pcs., cut as follows:
1 pc. 5" x 27¾" (boot)
1 pc. 4" x 13½" (cap)
1 pc. 5" x 13" (duct)
1 pc. 2" x 4" x 12" scrap softwood
1 roll masking tape

Safety Precaution

Handle *all* sheet metal carefully since *all edges are sharp.*

Preparing to Work

1. Get the necessary equipment and supplies.
2. Label each piece with masking tape. See layout drawings of boot, boot cap, and duct: Fig. 49A-1, 49A-2, and 49A-3.

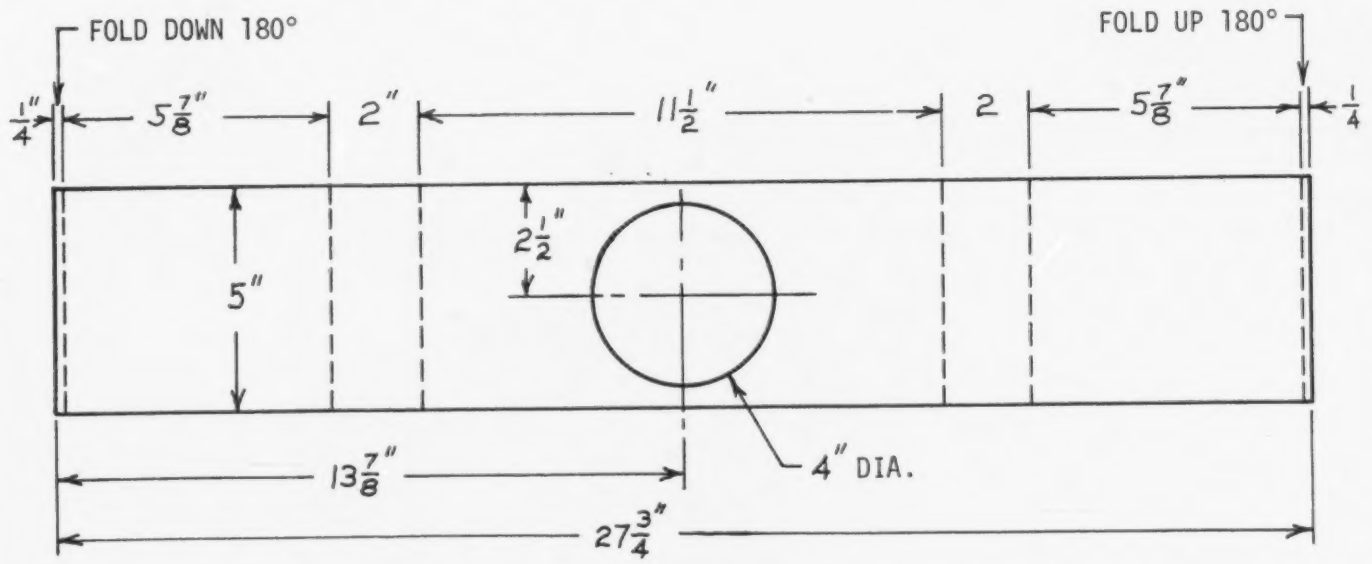

Fig. 49A-1. Boot Layout

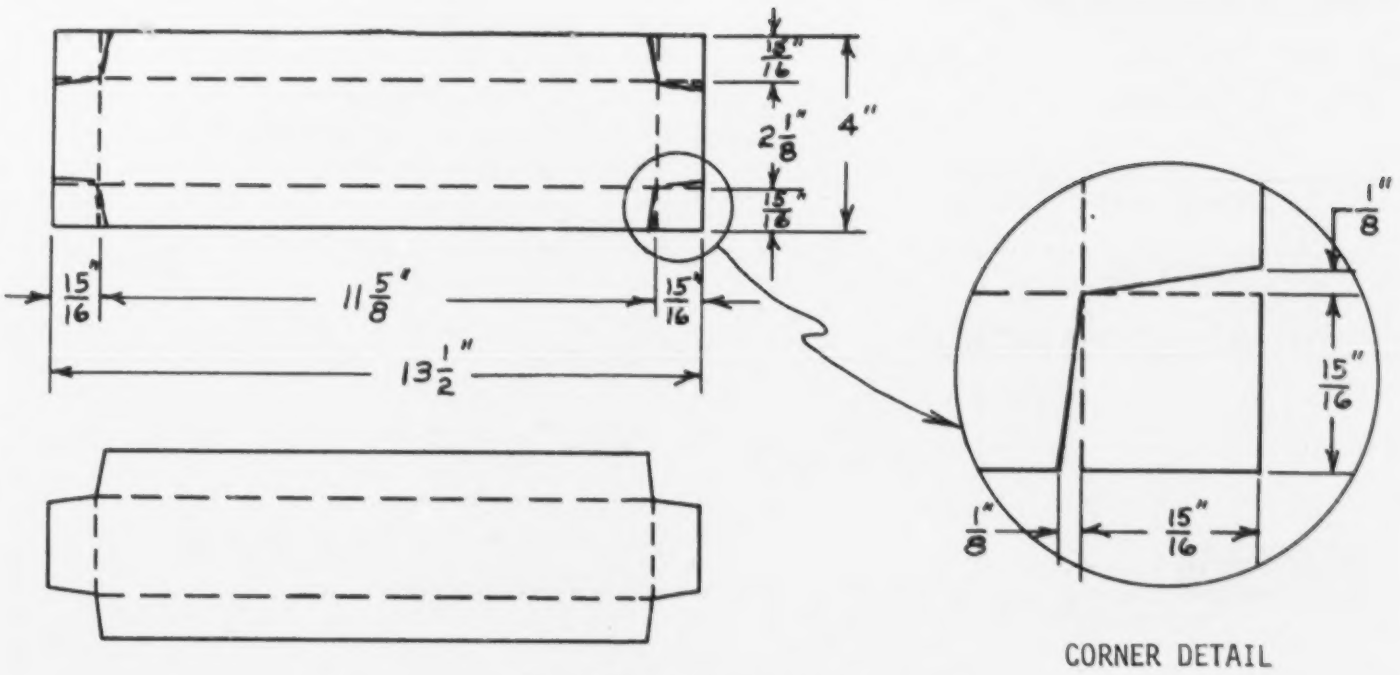

Fig. 49A-2. Boot Cap Layout

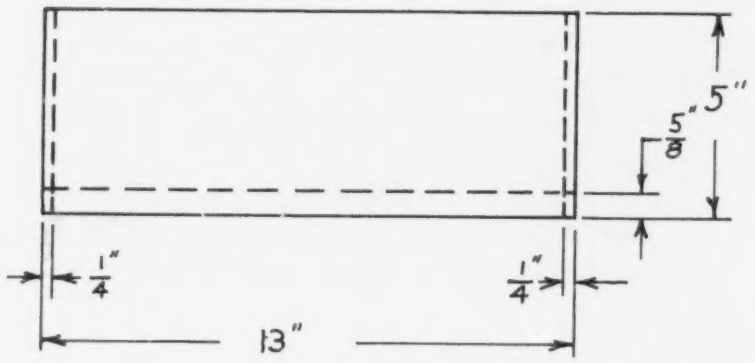

Fig. 49A-3. Duct Layout

3. On the boot locate the center of the circle. Mark it with the awl. Mark also the six fold lines. See Fig. 49A-4.
4. Scribe a 4" diameter circle with the dividers.
5. Put the boot over a piece of softwood. With a sharp cold chisel and a hammer, punch a hole through the metal inside the scribed circle.
6. Cut out the circle with the aviation snips.

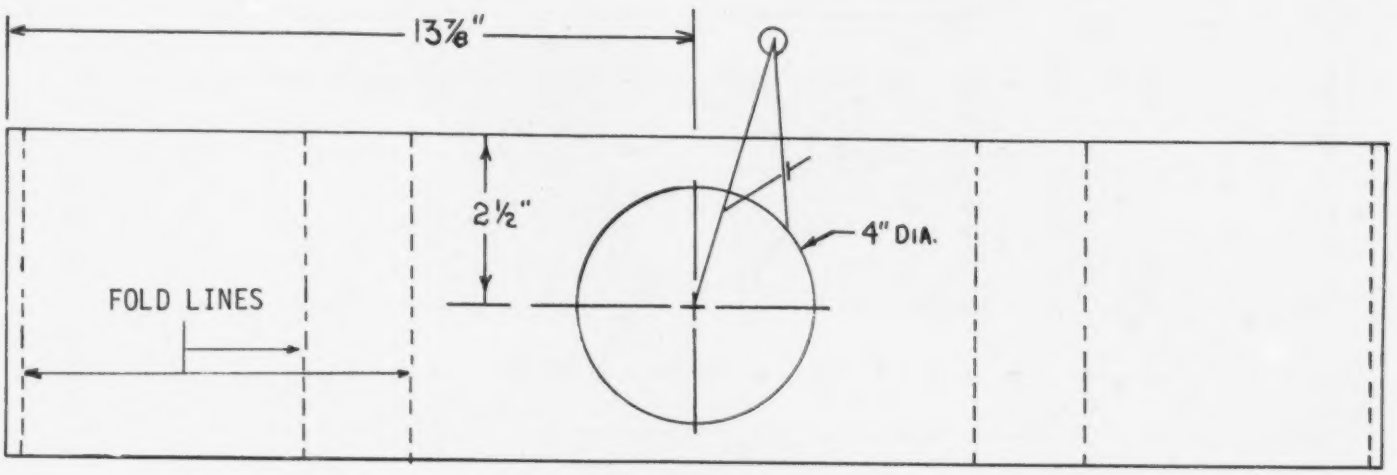

Fig. 49A-4. Finding the Center

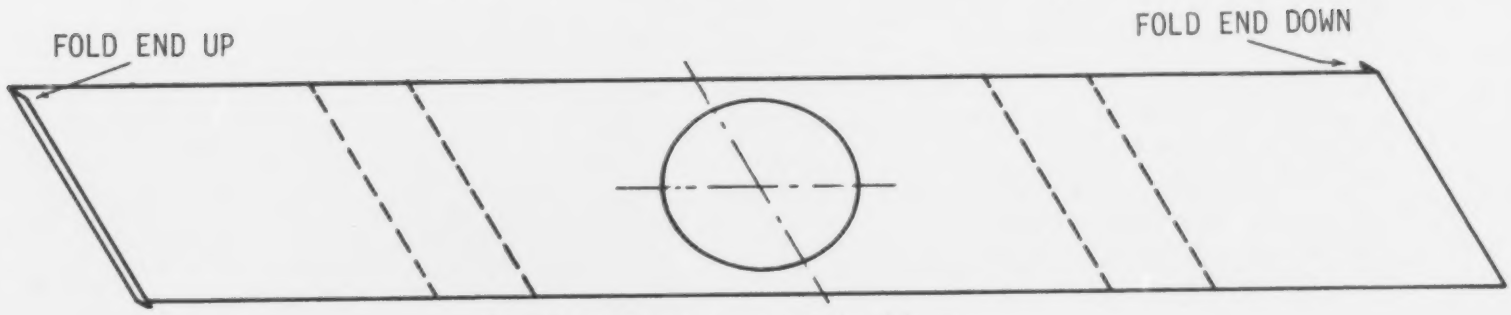

Fig. 49A-5. Bend Flaps at Ends of Boot

Fabricating Boot

7. Using the brake (or hand seamer) set at ¼", bend each end of the boot: one end up and one end down. See Fig. 49A-5.
8. Using either a brake, flat stake, wood block, or the edge of the workbench, bend the remaining four bends on the boot. See Fig. 49A-6.
9. Lock the two ends together, and use a hand groover to set the seam. See Fig. 49A-7.
10. Hammer down the seam. Lock it with a center punch in the center and about 1" from each end. See Fig. 49A-8.

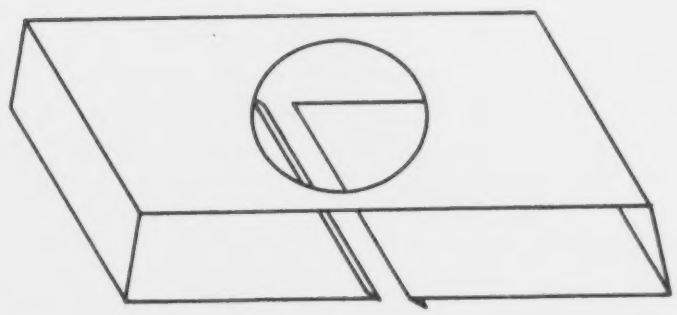

Fig. 49A-6. Boot Bent to Shape

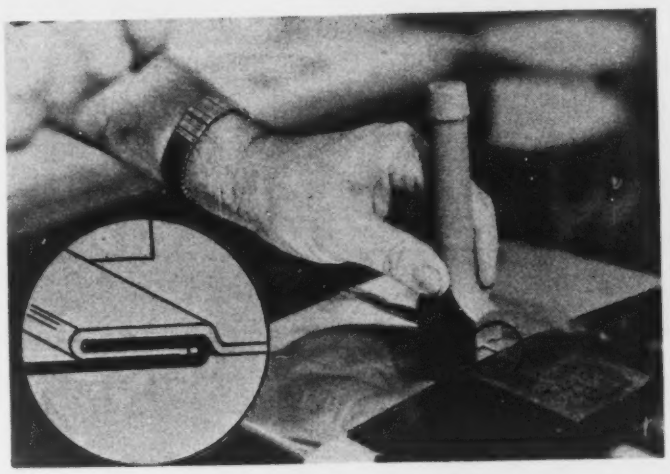

Fig. 49A-7. Setting the Seam

Fig. 49A-8. Locking the Seam

Fabricating Boot Cap

11. Lay out and scribe the fold lines and the cut lines of the boot cap, as shown in Fig. 49A-2.
12. Cut out the corners of the boot cap with snips. See Fig. 49A-9.
13. Set the brake (or hand seamer) at $^{15}/_{16}$", and bend all four sides up 90°.

Fig. 49A-9. Removing Boot Cap Corners

Fabricating Duct

14. On the duct, scribe a line $^{5}/_{8}$" in from one long edge. See Fig. 49A-3.
15. Set the hand seamer at $^{1}/_{4}$" and bend the two ends in opposite directions so they will interlock. See Fig. 49A-10.
16. Using either slip rolls, a round stake, or a piece of pipe locked in a vise, bend the metal into a cylinder. Be sure the scribed line is on the outside.
17. Lock, set, and hammer the seam as you did for the boot. See Fig. 49A-11.
18. With a center punch, lock the seam in the center and about 1" from each end.

Cleaning Up

19. Return all equipment and supplies to their proper location in the room, and clean the work area.

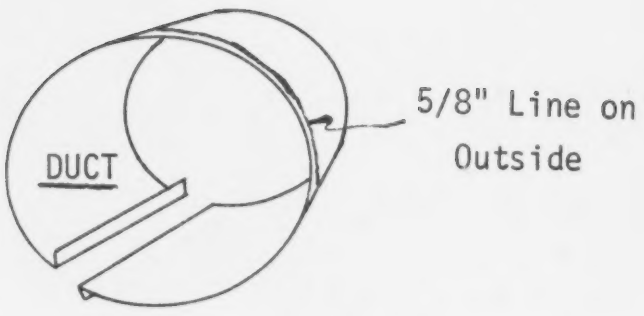

Fig. 49A-10. Bent Flaps at Ends of Duct

Fig. 49A-11. Finishing the Duct Seam

ACTIVITY 49B

Installing Heating, Cooling, and Ventilating Systems

Today three members of your group will do Problem 1 while two others do Problem 2.

Problem 1

Objective

Using proper equipment and supplies, assemble a sheet metal boot, boot cap, and round duct, with a dovetail joint.

Equipment (Subgroup: 3 students)

1 pr. aviation snips
1 pr. pliers
1 electric drill *or* hand drill
1 1/8" twist drill
1 screwdriver
1 awl

Supplies (Subgroup: 3 students)

6 No. 8 x 1/2" sheet metal screws
1 ea. boot, boot cap, and duct from Activity 49A

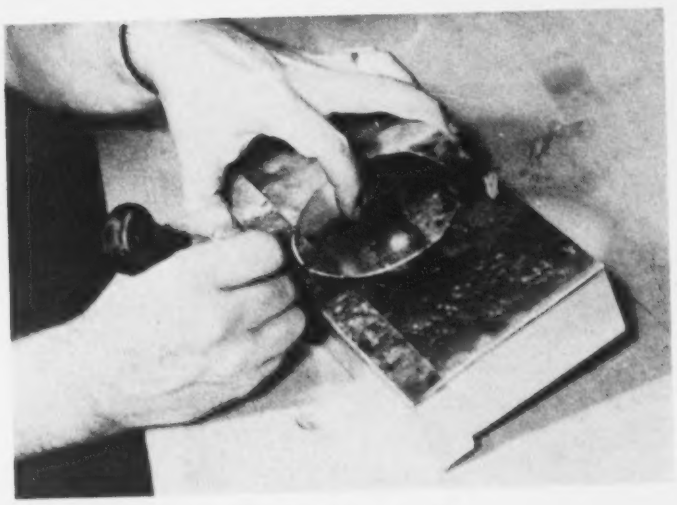

Fig. 49B-1. Scribing Line on Boot Cap

Safety Precaution

Handle *all* sheet metal carefully, as *all edges are sharp.*

Preparing to Work

1. Get the necessary equipment and supplies.

Trimming Cap

2. Place the boot cap over the boot. Use a scratch awl to scribe a line (freehand) where the cap covers the hole in the boot. See Fig. 49B-1.
3. Cut out the arc just scribed on one flap of the cap using the aviation snips.

Forming Tabs on Duct

4. Using the aviation snips, cut notches 1/2" apart down to the scratch mark on the duct to form tabs. See Fig. 49B-2.
5. Starting at the seam, use the pliers to bend every other tab 90° to the outside of the duct. See Fig. 49B-3.

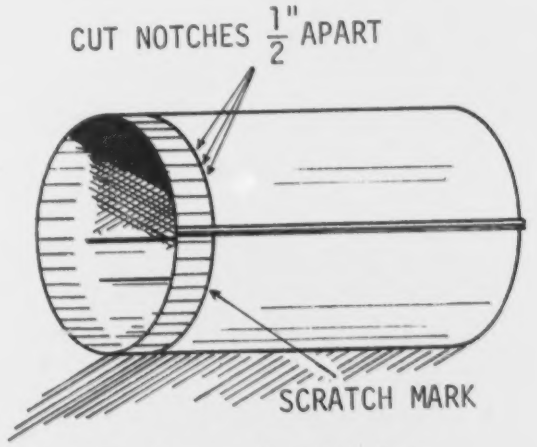

Fig. 49B-2. Marking Duct for Notches

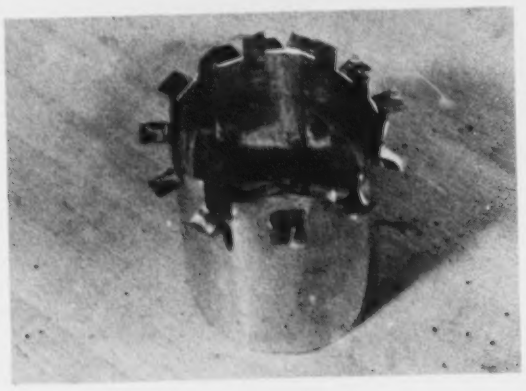

Fig. 49B-3. Flap Bends Completed

Assembling Boot and Duct

6. Place the notched end of the duct into the hole in the boot. See Fig. 49B-4.
7. Bend the tabs *down* on the inside of the boot. See Fig. 49B-5. This is a dovetail joint.

Fig. 49B-4. Completing Dovetail Joint

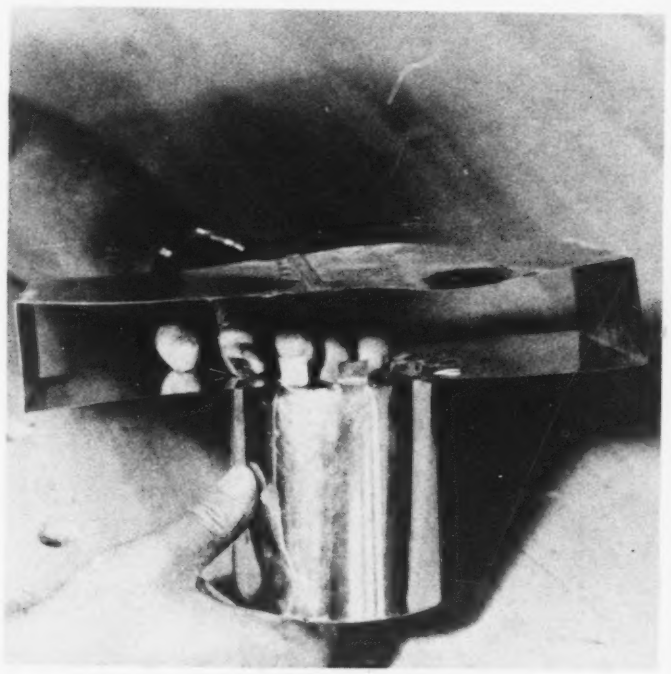

Fig. 49B-5. Attaching Duct to Boot

Fitting Cap to Boot

8. Fit the boot cap to the bottom of the boot assembly. Be sure the arc cut on the flap fits around the duct properly.
9. Use the center punch to mark a hole about 2½" from each end of each long flap and in the center of each end flap. See Fig. 49B-6.
10. Drill a ⅛" hole through each of the holes you have marked. See 49B-7.
11. Install a No. 8 x ½" sheet metal screw in each hole to fasten the cap to the boot. Tighten the screws carefully to avoid stripping the threads.
12. Return the equipment used in this problem.

Fig. 49B-6. Marking Boot Cap

Fig. 49B-7. Drilling Marked Holes

Problem 2

Objective

Given a sheet metal boot assembly and wood frame structure:

a. Lay out the location of the duct opening on the subfloor.
b. Saw out the subfloor opening.
c. Install the ductwork in the structure.

Equipment (Subgroup: 2 students)

1 try square
1 brace
1 No. 8 (½") auger bit
1 compass saw *or* sabre saw
1 claw hammer
1 center punch

Supplies (Subgroup: 2 students)

1 completed duct from Problem 1
2 6d box nails

Preparing to Work

1. Get the necessary equipment and supplies.

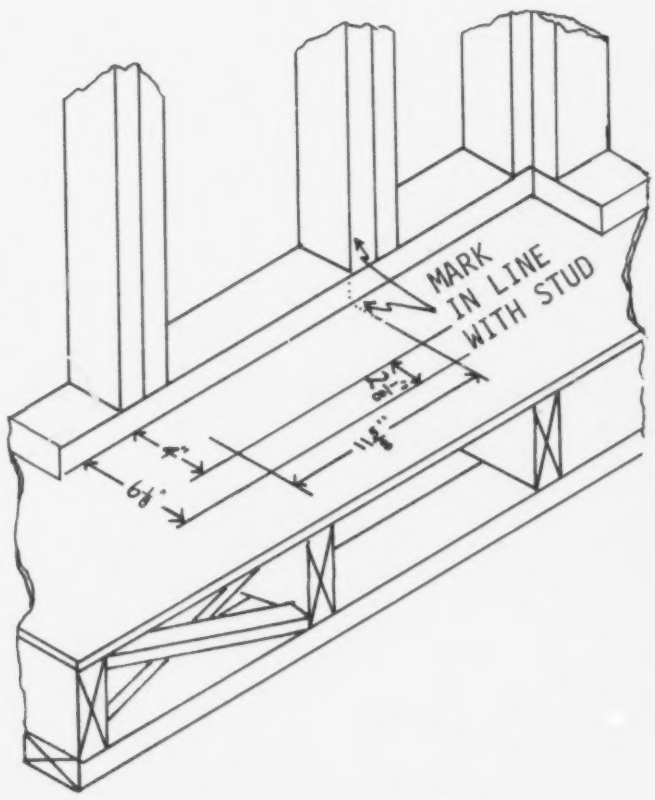

Fig. 49B-8. Layout for Boot Opening

Laying Out Boot Opening

2. On the subfloor, directly under the window, lay out an opening for the boot. See Fig. 49B-8. Check the length and width of the marked rectangle (2⅛" x 11⅝"). Check the corners. Are they square?
3. *Have the teacher check your layout for accuracy.*

Cutting the Opening

4. Bore a ½" hole *inside* each corner of the marked rectangle. See Fig. 49B-9.
5. Cut around the inside of the rectangle using a compass saw or sabre saw. See Fig. 49B-10.

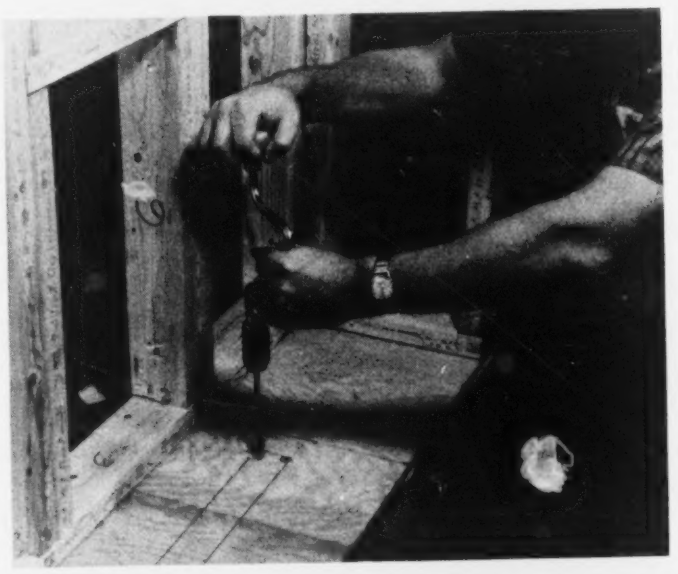

Fig. 49B-9. Boring Holes Inside Rectangle

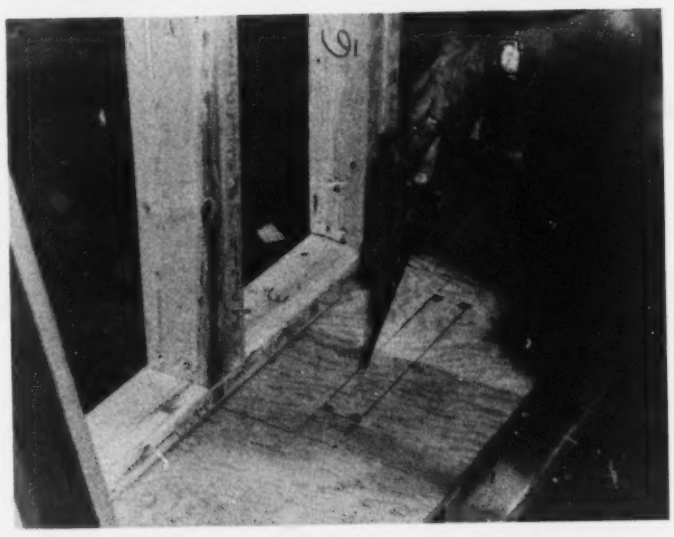

Fig. 49B-10. Sawing Rectangle

Installing Ductwork

6. Using a center punch, make a hole in each end of the boot ¼" from the edge. See Fig. 49B-11.
7. Set the ductwork in place. With the 6d box nails, nail the boot to the subfloor. See Fig. 49B-12.

Cleaning Up

8. Return equipment and supplies to their proper place. All students should help clean up the work area.

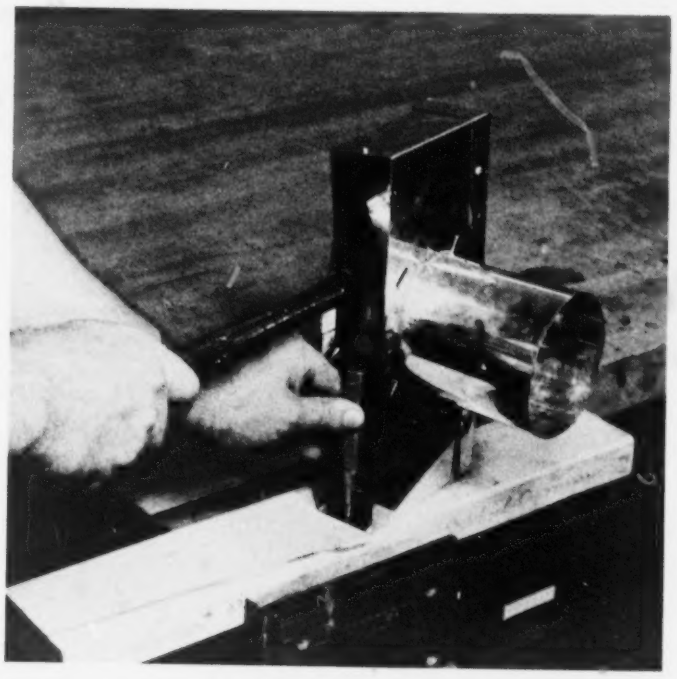

Fig. 49B-11. Punching Hole in End of Boot

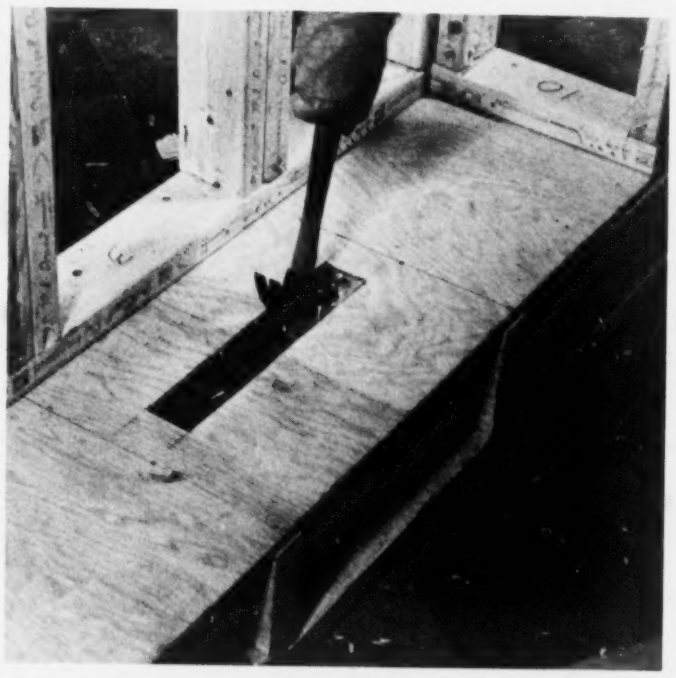

Fig. 49B-12. Nailing Boot to Subfloor

ACTIVITY 50

Installing Plumbing Systems

Today some students in your group will measure, mark, and bore holes for plumbing lines. Others will cut and thread pipe. Then you will install the cold water line.

Problem 1

Objective

1. Using a steel tape and try square, lay out the locations for the plumbing lines on your structure.
2. Using a brace and bit, bore holes for installing plumbing lines.

Equipment (Subgroup: 2 students)

1 steel tape
1 try square
1 brace
1 No. 16 (1″) auger bit

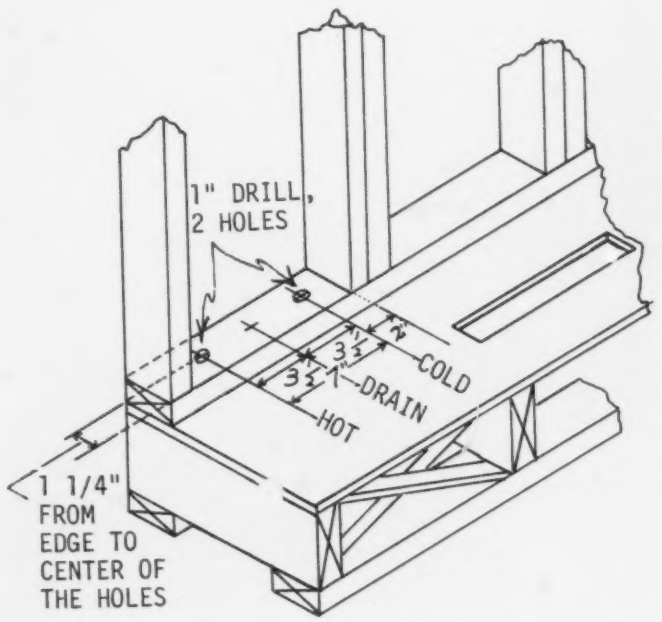

Fig. 50-1. Laying Out Location of Pipes

Preparing the Structure for Plumbing

1. Get the needed equipment and supplies.
2. Lay out the holes for the plumbing pipes as shown in Fig. 50-1.
3. Bore the holes for the cold water and hot water lines. Do *not* bore the hole for the drain line. See Fig. 50-2.
4. Return the equipment. Clean up the work area.

Problem 2

Objective

1. Using a pipe cutter and galvanized pipe, cut pipe to length.
2. Using a pipe stock and die, cut threads on galvanized pipe.
3. Using pipe wrenches, threaded pipe and fittings, assemble the pipe and fittings.

Equipment (Subgroup: 3 students)

1 pipe vise
1 pipe cutter
1 pipe reamer
1 ½″ pipe die and stock
1 10″ pipe wrench
1 steel tape
1 round file

Fig. 50-2. Boring Holes for Water Pipes

Supplies (Subgroup: 3 students)
1 pc. ½″ x 36″ galvanized pipe (to be cut into 12″, 14″, and two 5″ lengths)
2 ½″ 90° galvanized elbows (one drop-eared)
1 can cutting oil
1 can pipe dope w/brush
1 cloth or rag
1 can (empty: to catch cuttings and oil)

Safety Precaution

Whenever metal is being cut or threaded in any way, care must be taken to avoid being cut by the sharp edges or cuttings.

Preparing to Work

1. Get the needed equipment and supplies.

Cutting Pipe

2. Put the piece of pipe in the vise. Measure off 14″ on the pipe. See Fig. 50-3.
3. Cut off a 14″ piece of pipe. See Fig. 50-4.
4. Ream out the end of both pipes as shown in Fig. 50-5. Do not expand the pipe.

Threading Pipe

5. Cut a thread on the end of the 14″ pipe. Use cutting oil occasionally to aid in cutting. See Fig. 50-6. Cut the thread two turns past the face of the die as shown in Fig. 50-7.
6. Reverse the 14″ pipe in the pipe vise and repeat Steps 4 and 5.
7. *Thread* the 12″ and the two 5″ pipes the same way.
8. After the pipes have been threaded on

Fig. 50-4. Cutting the Pipe with a Pipe Cutter

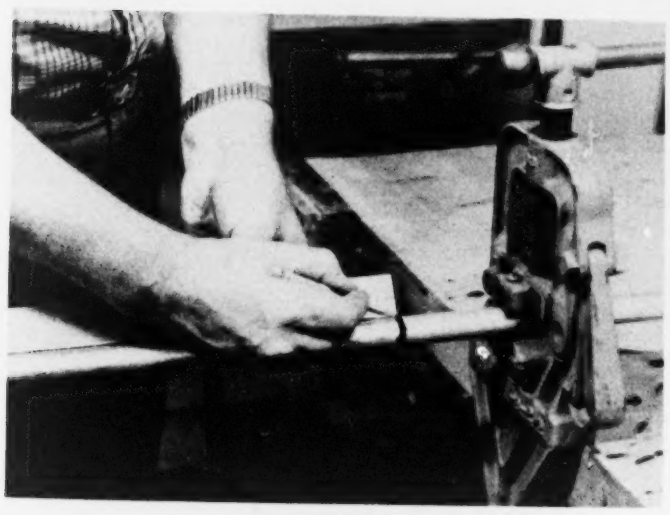

Fig. 50-3. Marking Pipe for 14″ Cut

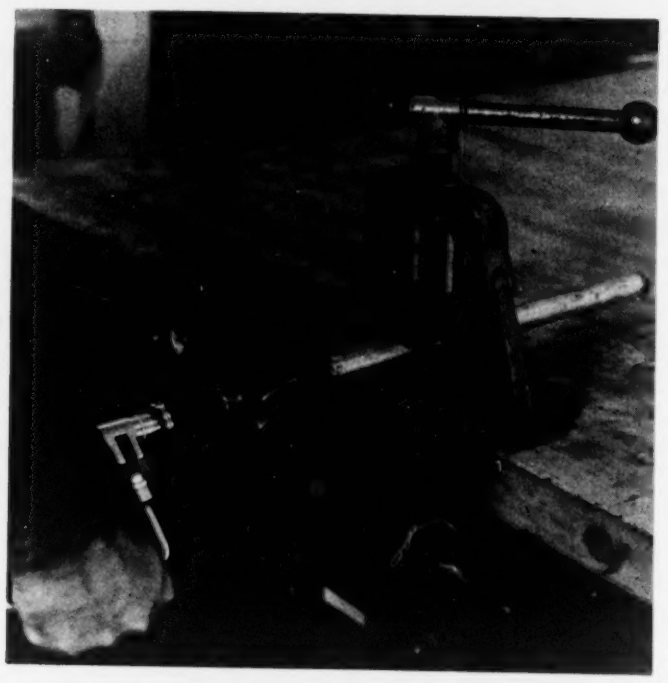

Fig. 50-5. Reaming Pipe End

both ends, clean out the inside edges with a round file as shown in Fig. 50-8. Wipe off the threads.

Assembling Pipe and Fittings

9. Apply pipe dope to the threads of pipes and elbows as you assemble them. See Fig. 50-9.
10. Tighten the plain 90° elbow on one end of the 12″ pipe using the pipe vise and

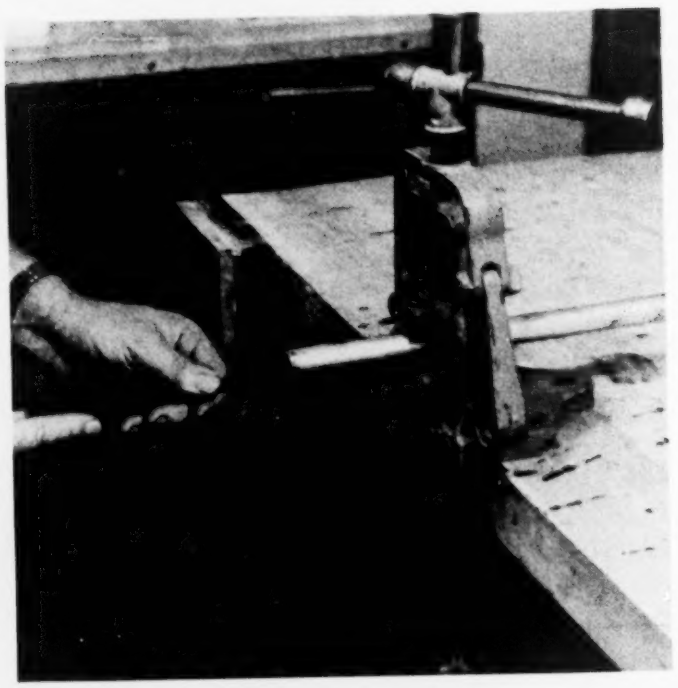

Fig. 50-8. Deburring

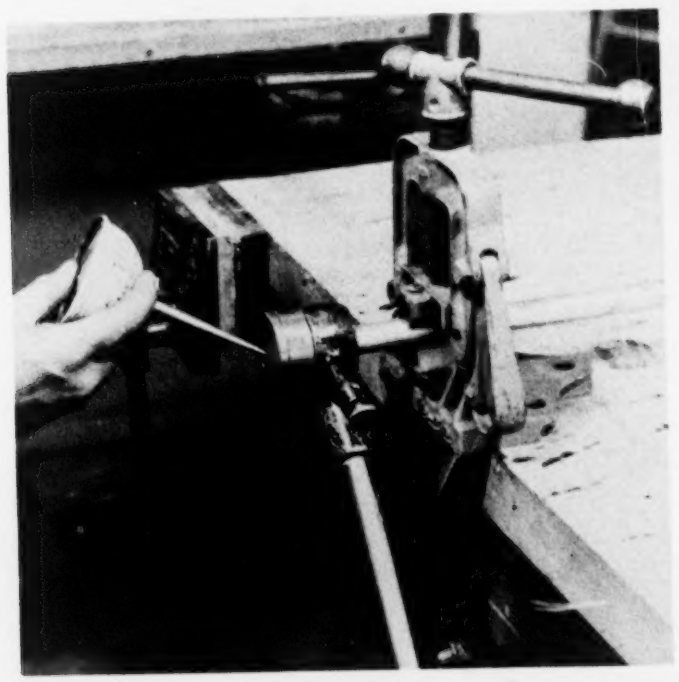

Fig. 50-6. Using Oil to Aid in Cutting Threads

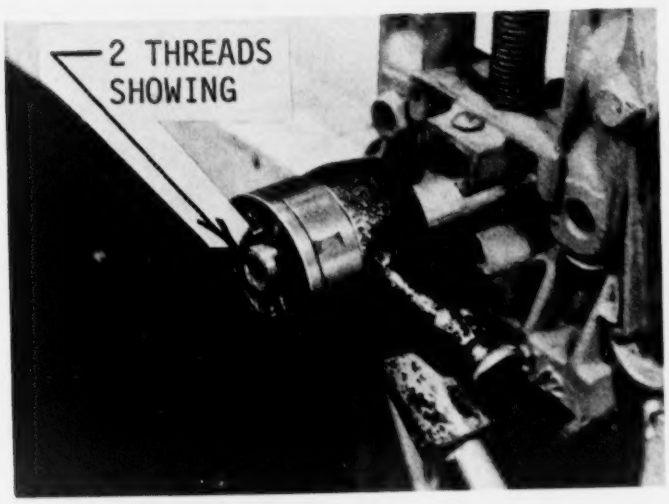

Fig. 50-7. Completing a Thread Cut

Fig. 50-9. Applying Pipe Dope

a pipe wrench. See Fig. 50-10. Tighten the drop-eared elbow on one end of the 14″ pipe.

Installing Pipe

11. Push the 12″ pipe between the floor joists until the center of the elbow is directly under the center of the hole. See Fig. 50-11.
12. Push the threaded end of the 14″ pipe through the hole until it lines up with the elbow under the floor. See Fig. 50-12.
13. Tighten the pipe into the 90° elbow, being careful not to cross-thread it.
14. Insert one 5″ pipe nipple in the drop-eared elbow. Save the other nipple for the next activity.

Cleaning Up

15. Return all equipment and supplies, and clean the work area.

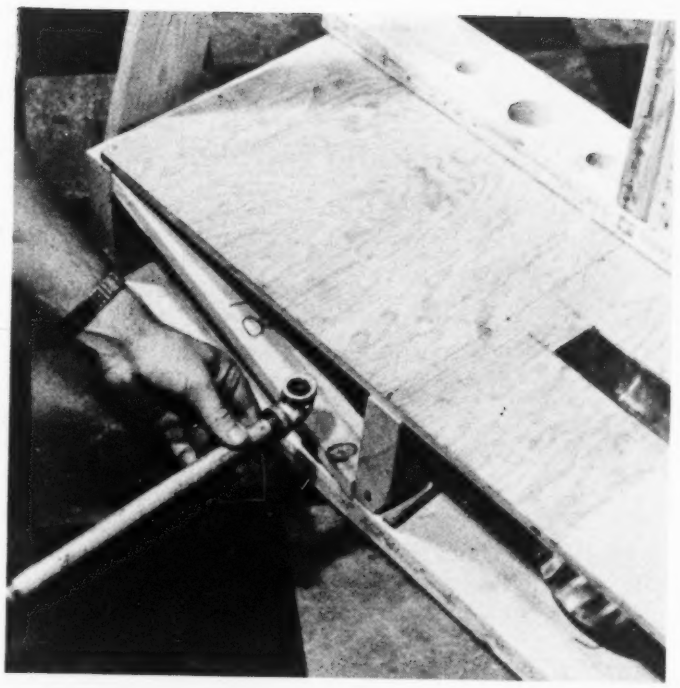

Fig. 50-11. Centering Pipe Under Cold Water Pipe Hole

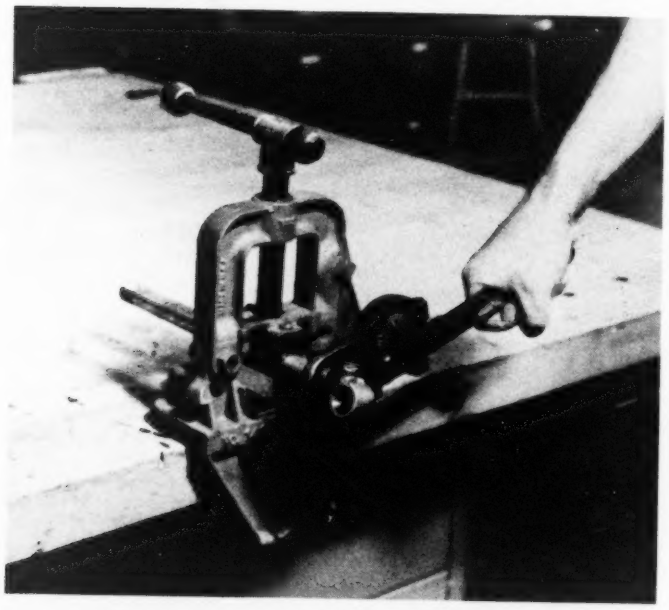

Fig. 50-10. Assembling 90° Elbow on 12″ Pipe

Fig. 50-12. Inserting Pipe Length Through Pipe Hole in Sole Plate

ACTIVITY 51A AND B

Installing Piping Systems

Today you will continue work on the plumbing system for your wall section and install a backing board and a nailer.

Problem 1

Objective

Using the proper equipment and supplies:

a. Cut and ream copper tubing.
b. Flux, assemble, and sweat-solder a copper tubing joint.

Equipment (Subgroup: 3 students)

1 steel tape
1 bench vise
1 tube cutter with reamer
1 pc. Transite *or* several fire bricks
1 propane torch (small tip)
1 striker (for torch)

Supplies (Subgroup: 3 students)

1 pc. ½" Type L, hard copper tubing (to be cut 14" long)
1 ½" copper x ½" F.I.P. drop-eared elbow
1 roll 50-50 solder
1 can soldering flux w/brush
1 pad steel wool
1 cloth or rag
1 ½" galvanized pipe nipple (from Activity 50)

Safety Precaution

Avoid being burned! Be careful when you light the torch. Use it carefully. Don't touch hot metal.

Preparing to Work

1. Get the needed equipment and supplies.

Cutting Tubing

2. Mark and cut one 14" length of tubing as shown in Figs. 51-1 and 51-2.
3. Ream each end of the tubing. See Fig. 51-3.

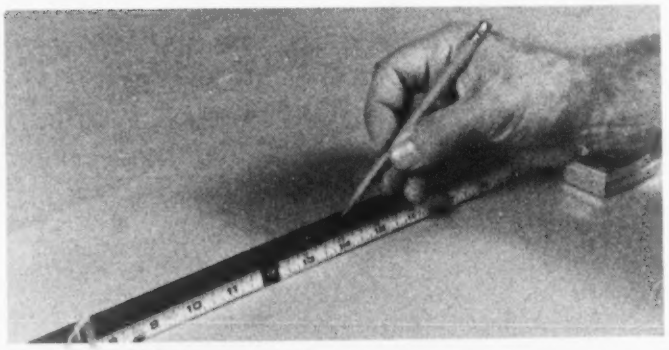

Fig. 51-1. Measuring Length of Tubing for Cut

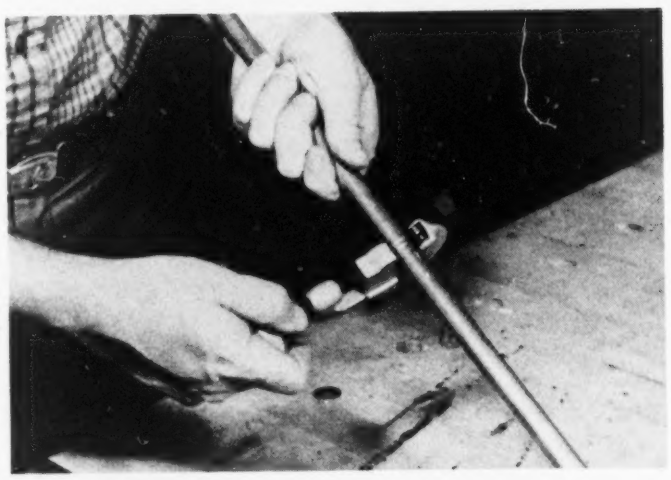

Fig. 51-2. Cutting Copper Tubing with a Tube Cutter

Fig. 51-3. Reaming Copper Tubing

Soldering Joint

4. Clean the outside surface of the tubing and the inside of the fitting with steel wool. See Fig. 51-4.
5. Apply flux to the cleaned surfaces and fit them together as shown in Fig. 51-5.
6. Clamp the tubing in the vise and place a piece of Transite under the joint.
7. Light the torch as shown by your teacher.
8. Sweat-solder the fitting to the tubing. See Fig. 51-6. Wipe off the excess solder as shown in Fig. 51-7.

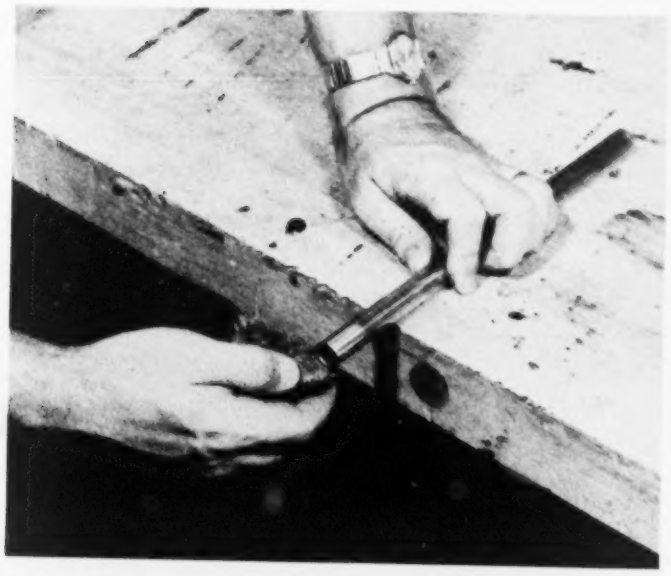

Fig. 51-4. Cleaning Copper Tubing

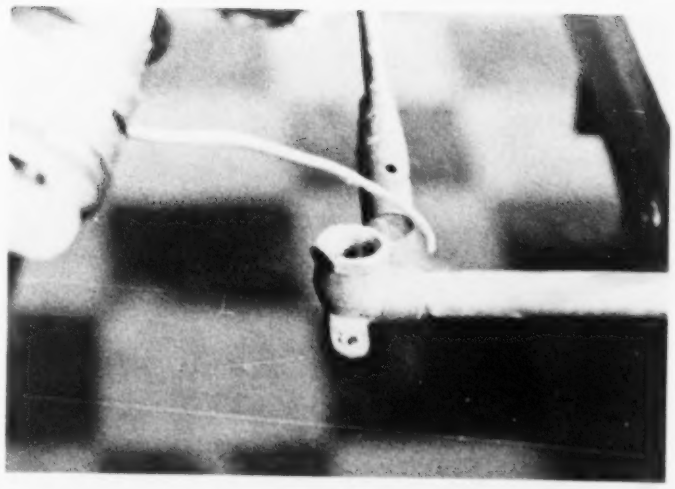

Fig. 51-6. Sweet-Soldering the Fitting to the Tubing

Fig. 51-7. Cleaning Off Excess Solder

Fig. 51-5. Applying Flux to Tubing

Fig. 51-8. Installing Copper Tubing Through Sole Plate

Installing Hot Water Line

9. Slip the piece of tubing through the hot water hole in the sole plate as shown in Fig. 51-8.
10. Tighten the 5″ galvanized pipe nipple in the drop-eared elbow.

Problem 2

Objective

1. Using the proper equipment and supplies:
   a. Measure the distance between studs.
   b. Lay out and cut a backing board and nailer.
   c. Install the backing board and nailer.
2. Using proper equipment and supplies, secure the tubing assembly and pipe assembly to the backing board.

Equipment (Subgroup: 2 students)

1 screwdriver
1 steel tape
1 crosscut saw
1 claw hammer

Supplies (Subgroup: 2 students)

1 ½″ pipe clamp
2 pcs. 1″ x 1″ x 8″ wood
1 pc. 1″ x 6″ board (to be cut to fit between studs)
1 pc. 2″ x 4″ x 12″ wood (nailer)
4 No. 7 x ¾″ flat head screws
8 6d box nails
3 16d common nails

Preparing to Work

1. Get the needed equipment and supplies.

Cutting Backing Board

2. Measure the distance between the wall studs as shown in Fig. 51-9. Cut a piece of 1″ x 6″ board to that length.

Installing Backing Board

3. Nail 1″ x 1″ x 6″ blocks to the studs 9″ up from the sole plate as shown in Fig. 51-10.
4. Hold the backing board against the blocks, and toenail it to the studs as shown in Fig. 51-11.

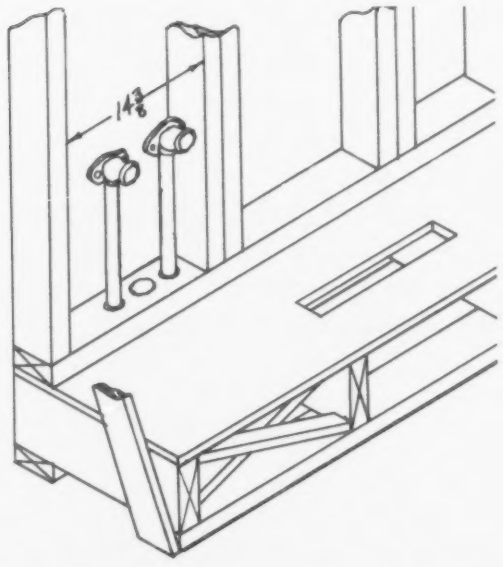

Fig. 51-9. Measuring for Backing Board (5″ nipples are removed.)

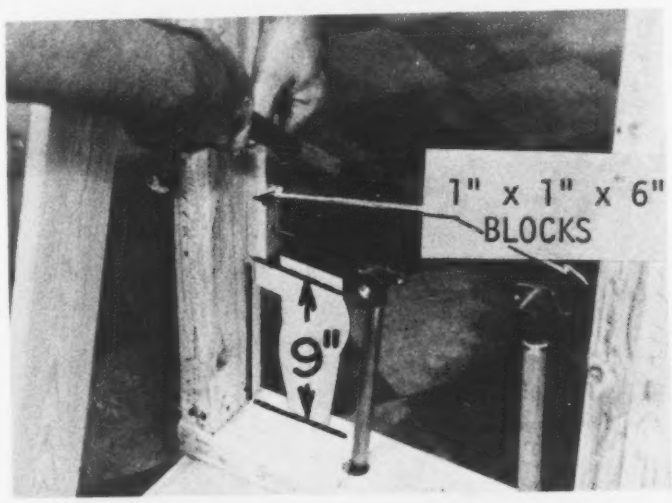

Fig. 51-10. Installing Blocks for Backing Boards (5″ nipples are removed.)

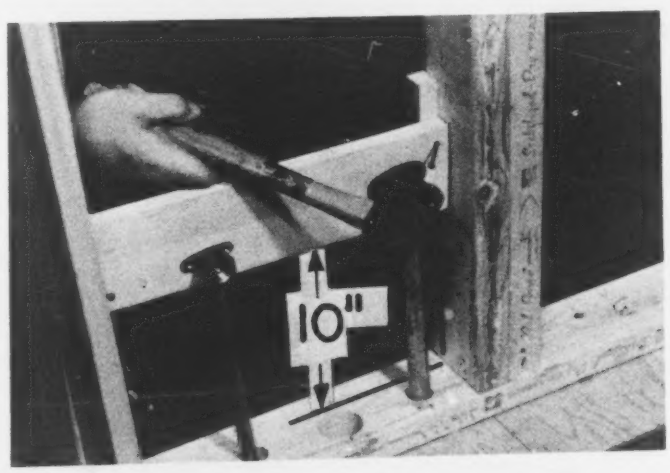

Fig. 51-11. Installing Backing Board for Hot and Cold Water Pipes (5″ nipples are removed.)

5. Attach the elbows to the backing board. See Fig. 51-12.

Installing Nailer

6. The 2″ x 4″ board will be installed in the short wall above the double plate. Place it in position as shown in Fig. 51-13. If it projects beyond the end of the plate, mark and cut it to length.

7. Nail the board in place as shown in Fig. 51-13. (Note nail placement.) This board, called a *nailer,* will be used to support the ceiling when it is installed.

Cleaning Up

8. Clean up the work area, and return all equipment.

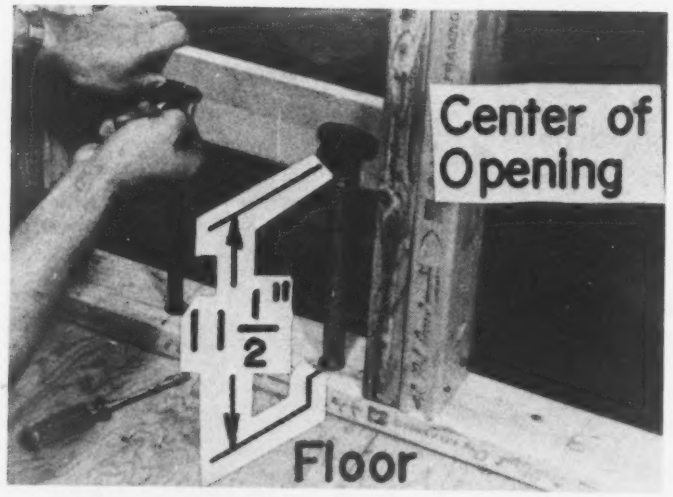

Fig. 51-12. Marking for Placement of Screws (5″ nipples are removed.)

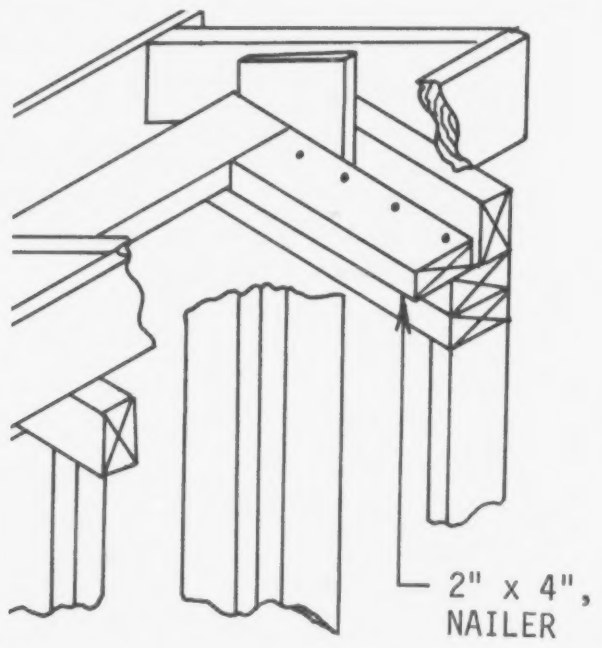

Fig. 51-13. Nailer Installed

ACTIVITY 52

Installing Electrical Power Systems

Today's activity will involve laying out the electrical run on the structure, boring holes in framing members for electrical wiring, and installing electrical boxes.

Problem 1

Objective

Using the proper equipment and supplies, lay out the wiring run for the electrical wiring system.

Equipment (Group of 5)
1 steel tape
1 try square

Supplies (Group of 5)
1 black lumber crayon

Preparing to Work

1. Get the needed equipment and supplies.

Laying Out the Wiring System

2. Use the black lumber crayon to lay out the wiring run on the subfloor. See Fig. 52-1.
3. Measure and mark hole centers according to details A, B, C, and D of Fig. 52-2.

Problem 2

Objective

Using the proper equipment and supplies, and following safe and proper procedures, drill holes to receive the electrical wiring in your structure.

Equipment (Group of 5)
1 electric drill
1 7/8" speed bit

Safety Precautions

1. Be sure the bit is tight in the drill chuck.
2. Be sure the chuck key is removed from the chuck.
3. Wear goggles to protect your eyes when drilling or watching others drill.
4. Drill *away* from your body.
5. Keep both hands away from the revolving bit.

Preparing to Work

1. Get the needed equipment and supplies.
2. Chuck a 7/8" speed bit in the electric drill. See Fig. 52-3.

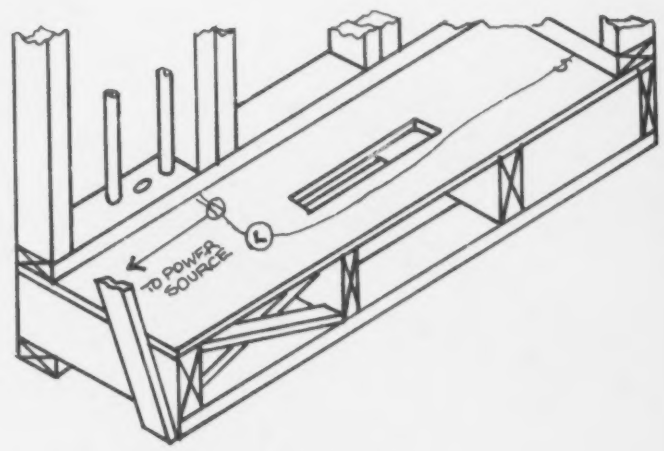

Fig. 52-1. Laying Out Wiring Run

Fig. 52-3. Chucking Speed Bit in Drill

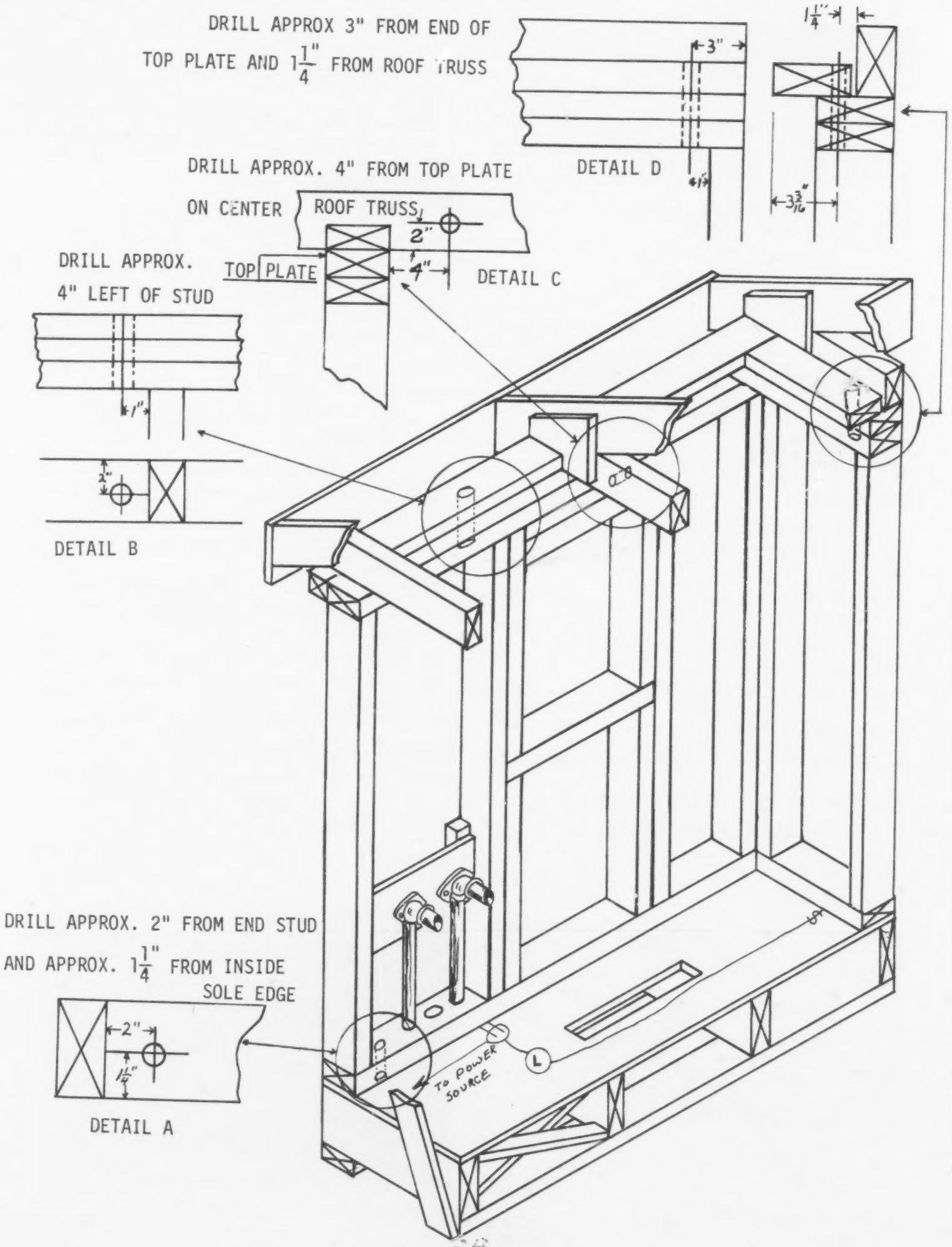

Fig. 52-2. Guide for Electrical Layout

Drilling

3. Drill holes, A, B, C, and D. Figure 52-4 shows proper use of a speed bit in an electric drill.

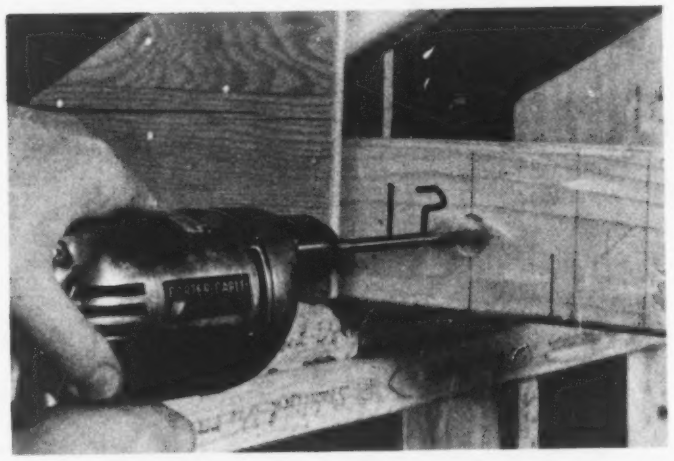

Fig. 52-4. Drilling Hole with Speed Bit in Electric Drill

Problem 3

Objective

Using the proper equipment and supplies, locate and install electrical outlet boxes in your structure.

Equipment (Group of 5)

1 screwdriver
1 pr. 6″ slip joint pliers
1 claw hammer
1 ¾″ x 4″ board, approx. 30″ long (for locating bar hanger)

Supplies (Group of 5)

1 octagon outlet box with loom clamps
1 adjustable bar hanger, 22⅜″
1 conduit duplex outlet box with side knockout
1 switch box with loom clamps and bracket
2 16d nails
4 6d nails
4 No. 8 x ½″ pan head sheet metal screws

Preparing to Work

1. Get the needed equipment and supplies.

Locating Boxes and Bar Hanger

2. Find where the switch outlet box will go by measuring up 27″ from the top of the sole plate. See Fig. 52-5. Mark this point.

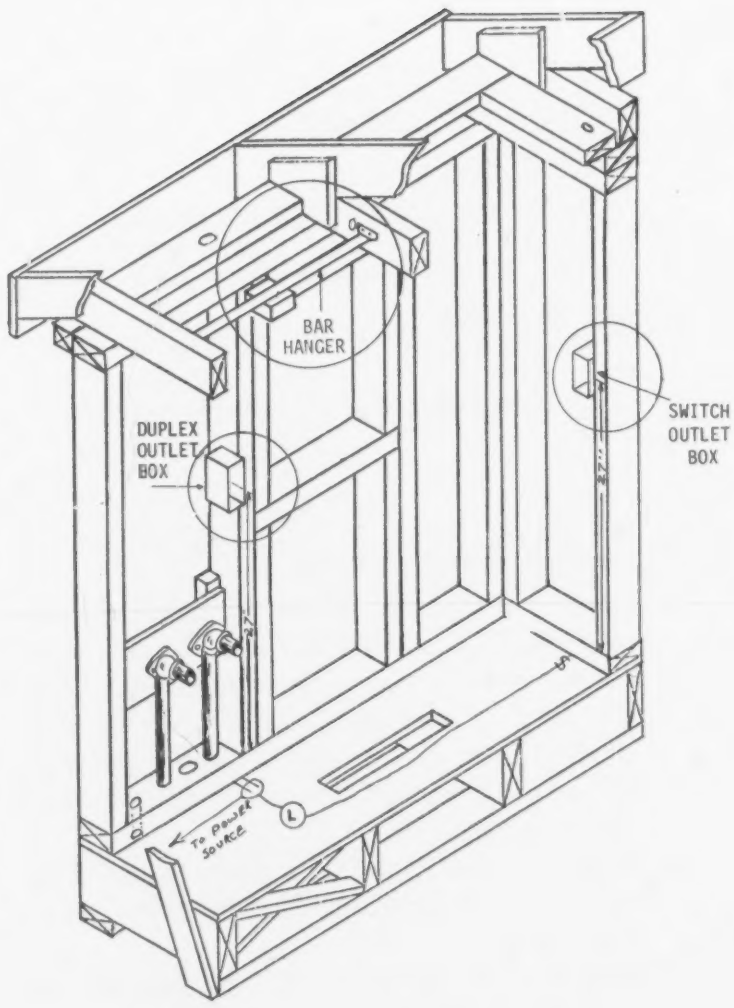

Fig. 52-5. Placing Bar Hanger and Outlet Boxes

3. In the same way, find and mark where the duplex outlet box will go.
4. Mark the location of the bar hanger on the ceiling joists. See Figs. 52-6 and 52-7.

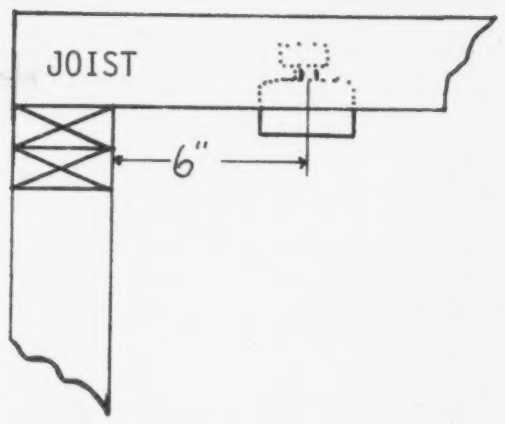

Fig. 52-6. Bar Hanger Location from Wall

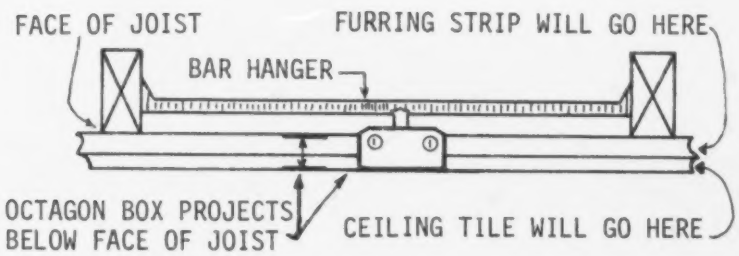

Fig. 52-7. Bar Hanger Location Between Joists

Installing Outlet Boxes

5. Locate the boxes on the studs as shown in Figs. 52-5 and 52-8. Note: Locate each box so that it projects (sticks out) past the face of the stud. *Your teacher will tell you how far the boxes should project.* This will depend on how thick the wall material will be.
6. Nail the switch box in place as in Fig. 52-9. Nail the duplex box in place as in Fig. 52-10.
7. Remove the knockout in the top of the octagon box, and secure the box to the bar hanger.
8. Secure the bar hanger to two ceiling joists as shown in Figs. 52-5, 52-7, and 52-11. **Note:** Install the octagon box so that it projects below the face of the ceil-

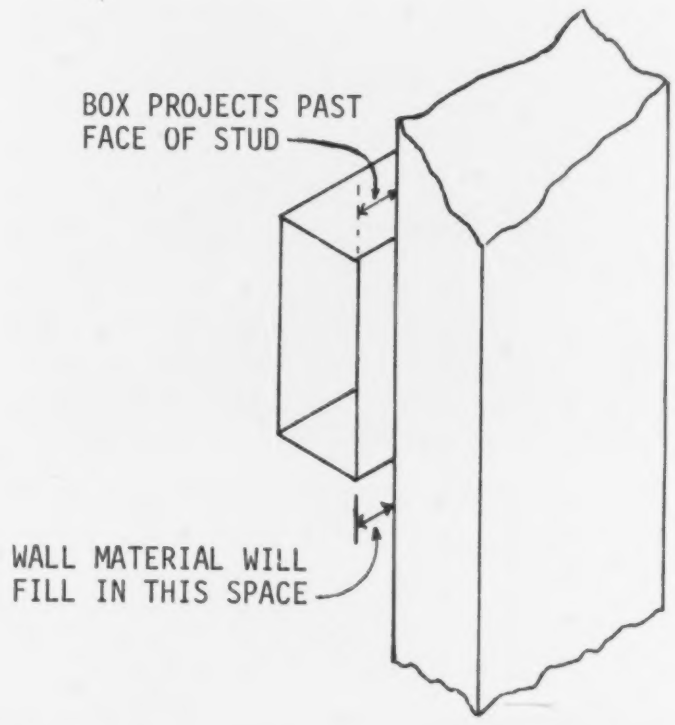

Fig. 52-8. Switch Box Location

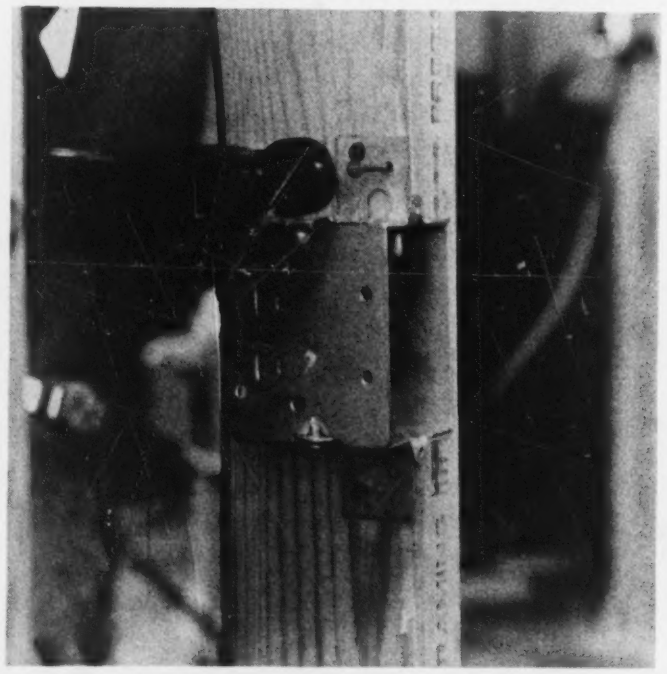

Fig. 52-9. Nailing Switch Box to Studding

ing joists to allow for furring strips and ceiling tile. Use a board ¾″ thick and a ceiling tile as a guide.

Cleaning Up

9. Return all equipment and supplies, and clean up the work area.

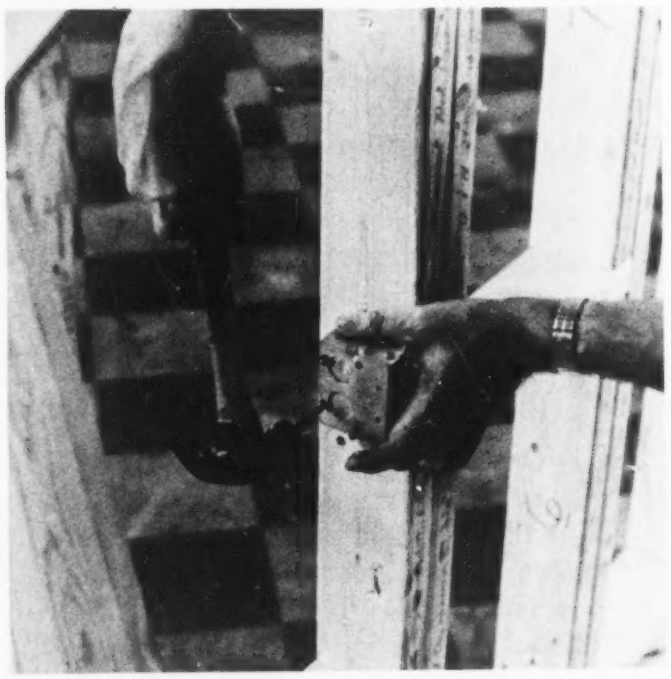

Fig. 52-10. Nailing Duplex Outlet to Studding

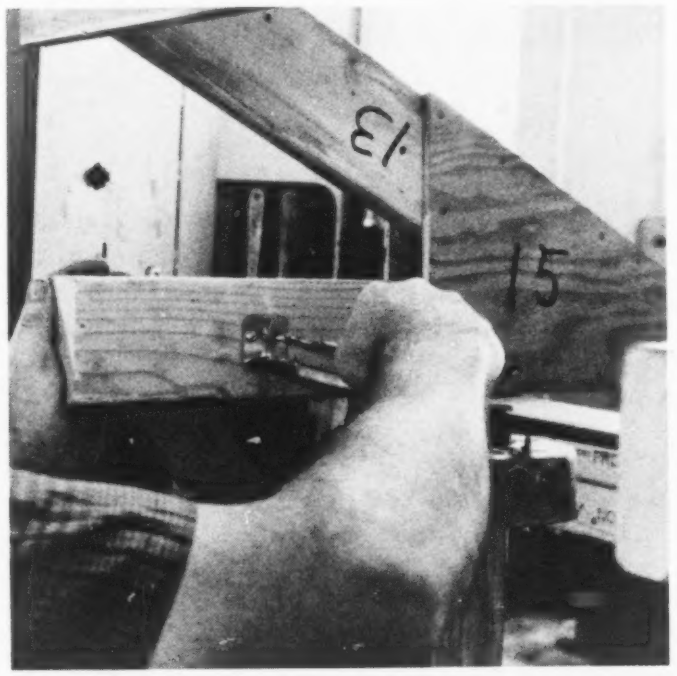

Fig. 52-11. Securing Bar Hanger to Ceiling Joist

ACTIVITY 53

Installing Electrical Communication Systems

Today you will install thinwall conduit (EMT), nonmetallic sheathed cable (Romex), and flexible armored cable (BX), and you will pull wire through the conduit. See Fig. 53-1.

Problem 1

Objective

Using the proper equipment and supplies, prepare and install thinwall conduit.

Equipment (Group of 5)

1 ½" conduit bender
1 pr. 6" slip joint pliers
1 hacksaw
1 round file *or* pipe reamer
1 brace, if pipe reamer is used
1 screwdriver
1 steel tape

Supplies (Group of 5)

1 pc. ½" thinwall conduit (EMT), to be sawed to 37" tength
1 ½" EMT box connector
1 ½" EMT hanger
1 No. 8 x ¾" flat head screw

Safety Precautions

1. When using a hacksaw:
   a. Wear goggles to avoid getting metal particles in eyes.
   b. Use the saw carefully to avoid cutting yourself with a broken blade.
2. Never touch a sharp edge or point on cut metal.
3. Avoid puncturing your skin, or anyone else's, with the ends of wires.

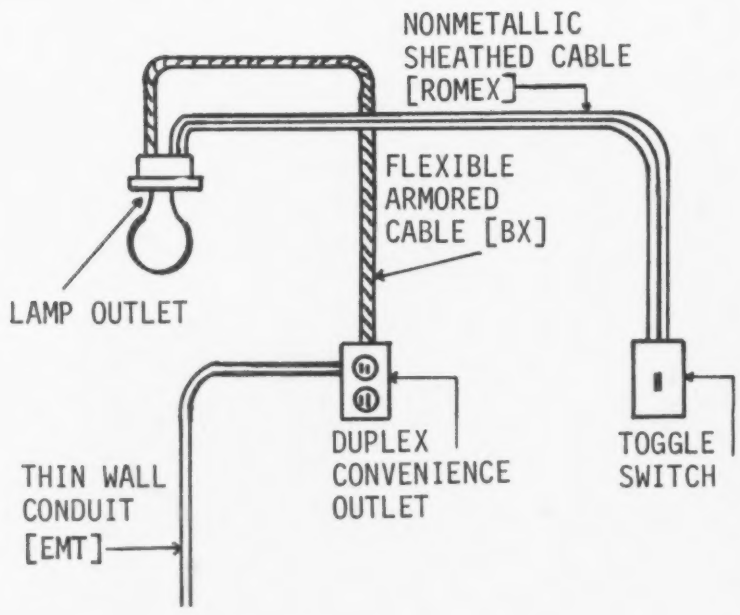

Fig. 53-1. Electrical Installation

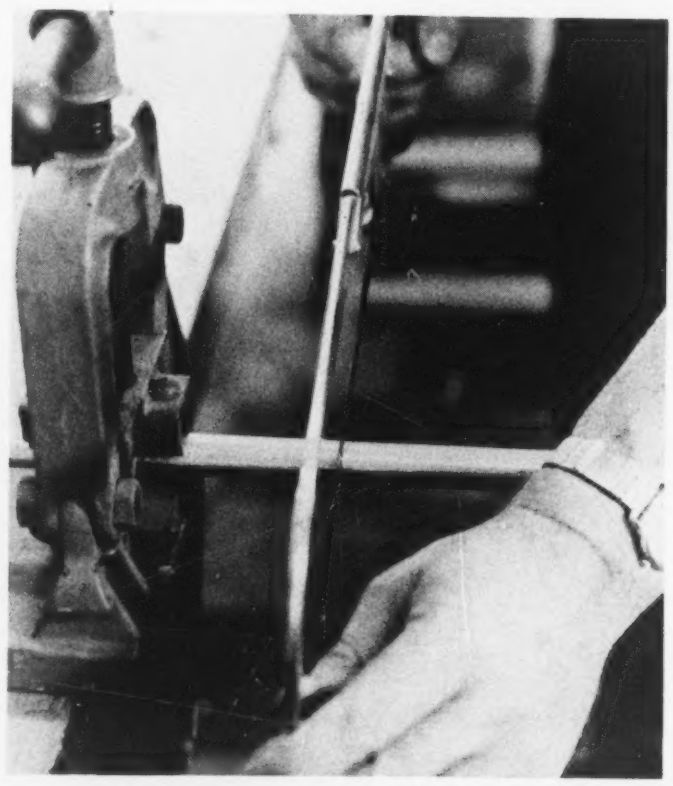

Fig. 53-2. Cutting Thinwall Conduit

Preparing to Work

1. Get the needed equipment and supplies. Follow your teacher's instructions about dividing up the tasks.

Preparing Thinwall Conduit

2. Saw the conduit 37″ long. See Fig. 53-2. Ream it with a pipe reamer or round file as shown in Figs. 53-3 and 53-4.

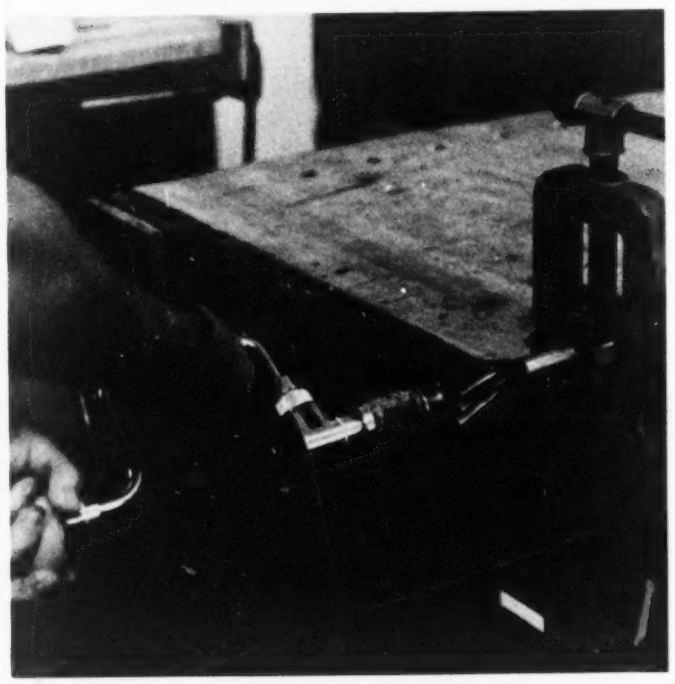

Fig. 53-3. Removing Burr with Reamer

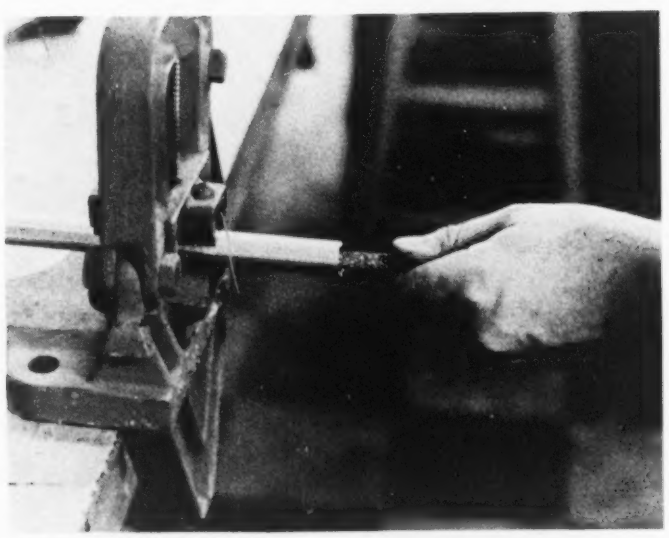

Fig. 53-4. Alternate Technique: Removing Burr with Round File

Bending Thinwall Conduit

3. Make a stub bend 10½″ from one end as follows:
   a. Determine the take-up (arc distance) of the bender. If the take-up is 5″, measure 5½″ from one end of the tubing and mark.
   b. Place the conduit bender on the conduit so that the arrow on the bender is in line with the layout mark on the conduit. See Fig. 53-5.
   c. Lay the conduit on the floor. Using the bender, bend the conduit to a 90° angle as in Fig. 53-6.

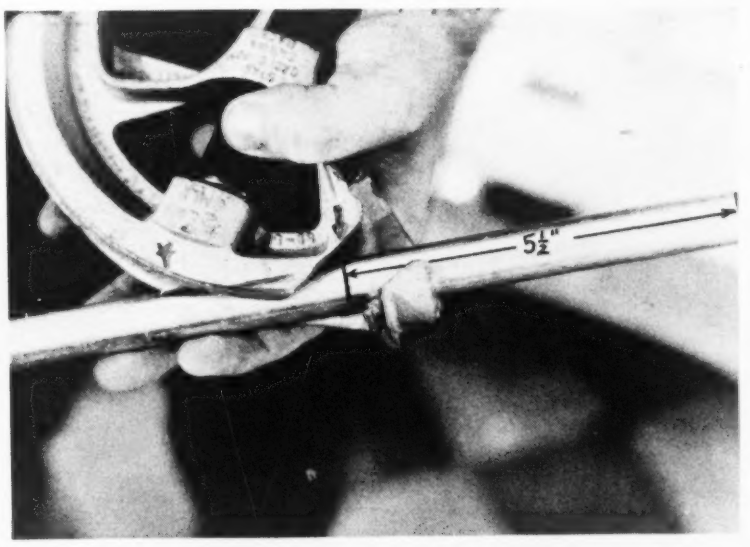

Fig. 53-5. Placing Conduit in Bender

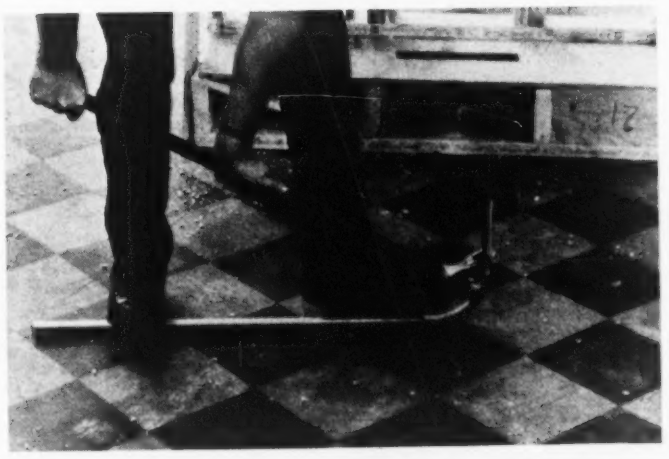

Fig. 53-6. Completing 90° Stub Bend

Installing Conduit

4. Remove the knockout from the side of the duplex outlet box, and attach the EMT connector as in Fig. 53-7.
5. Hold the conduit so that the end of the longer, straight part drops down through the hole in the sole plate. Attach the short end to the EMT connector in the box.
6. Attach the conduit to the backing board (Fig. 51-11) using a ½" EMT hanger and No. 8 x ¾" flat head screw.

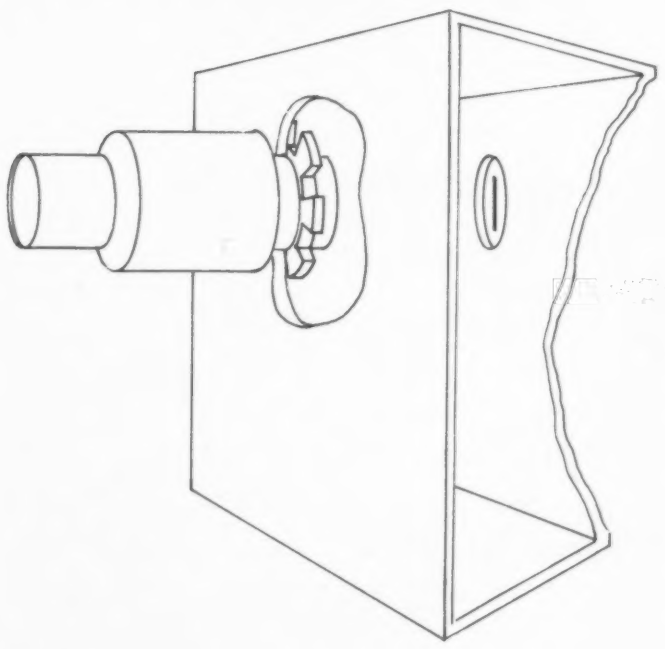

Fig. 53-7. Connector Installed

Problem 2

Objective

Using the proper equipment and supplies, prepare and pull T.W. wire through conduit, (EMT).

Equipment (Group of 5)

1 pr. 6" slip joint pliers
1 fish tape

Supplies

1 6' length No. 12 T.W. wire, white
1 6' length No. 12 T.W. wire, black
1 6' length No. 12 T.W. wire, green

Preparing to Work

1. Get the fish tape and wire.

Fishing Wires through Tubing

2. Push the fish tape all the way through the conduit. See Fig. 53-8.
3. Fasten all three wires to the tape as in Fig. 53-9.

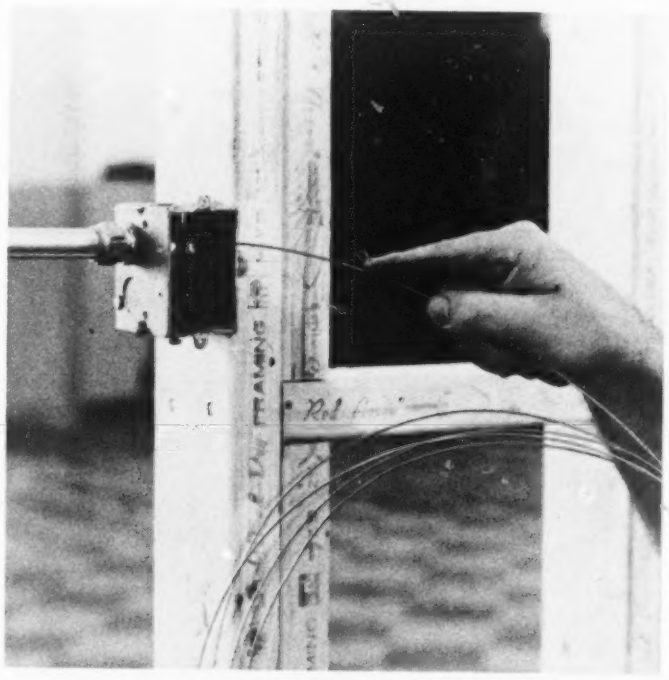

Fig. 53-8. Pushing Fish Tape Through Conduit

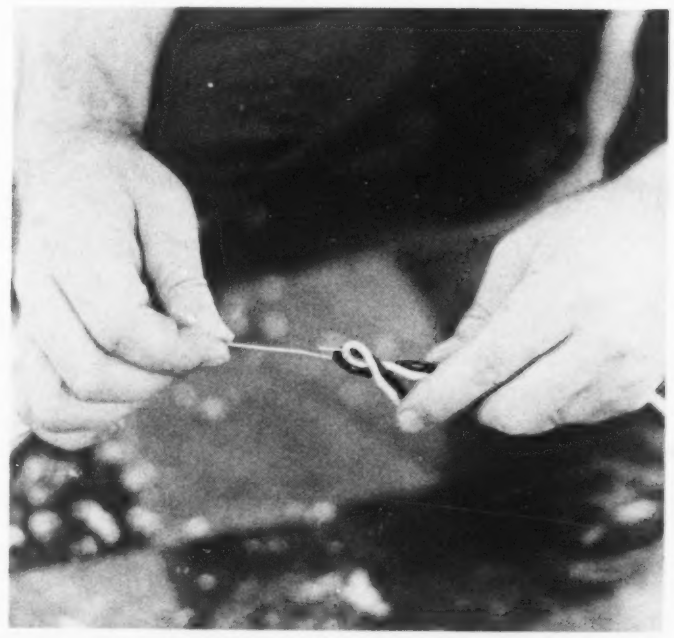

Fig. 53-9. Hooking T.W. Wires to Fish Tape

4. Pull or "fish" the wires through the conduit by pulling on the fish tape. See Fig. 53-10. The wire ends should extend about 6″ out of the outlet box.

Problem 3

Objective

Using the proper equipment and supplies, prepare and install flexible armored cable (BX).

Equipment

1 steel tape
1 claw hammer
1 hacksaw

Supplies

1 5′ length No. 16/2 with ground flexible armored cable (BX)
2 armored cable (BX) box connectors (for ⅜″ cable)
2 insulating bushings (for ⅜″ BX)
2 ⅜″ armored cable staples

Preparing to Work

1. Get the needed equipment and supplies.

Preparing Cable

2. Measure and mark 6″ from each end of the 5′ length of BX cable.
3. On both ends of the BX cable, use a hacksaw to cut the *metal armor* at right angles to the spiral as shown in Fig. 53-11. **Warning:** Cut only through one metal section; do not cut the wires inside the cable.

Preparing Boxes

4. Remove the knockout in the top of the duplex outlet box and the knockout in one side of the octagon outlet box.
5. Place and tighten BX box connectors on the duplex outlet box and the octagon outlet box.

Installing Cable

6. Insert insulating bushings between the metal armor and the wires on each end of the BX cable. See Fig. 53-12.

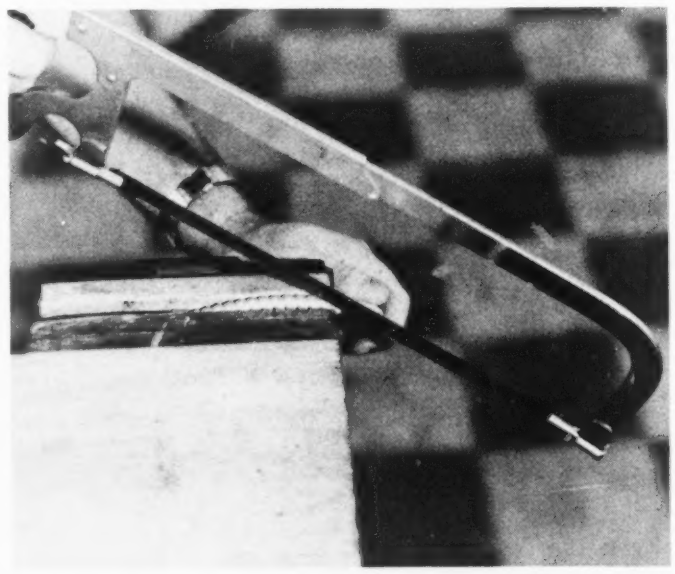

Fig. 53-11. Cutting Metal Armor on BX Cable

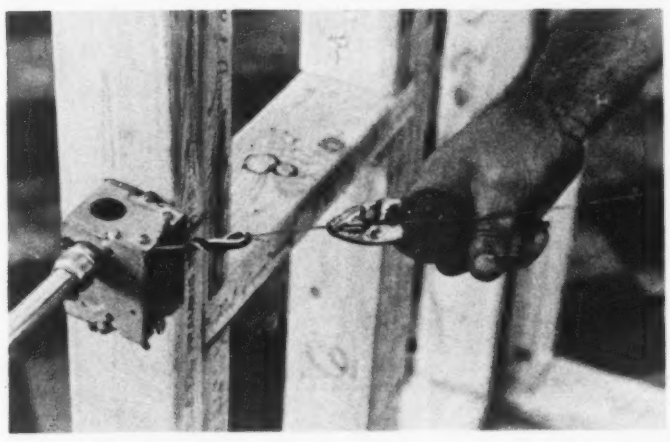

Fig. 53-10. Pulling T.W. Wires Through Conduit

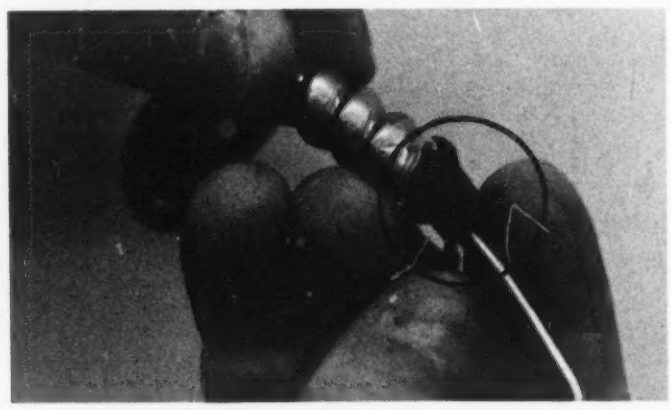

Fig. 53-12. Installing Insulating Bushing

7. Run the BX cable from the duplex outlet box through the hole in the top plate and to the octagon outlet box.
8. Secure the BX cable to the duplex outlet box and to the octagon outlet box by tightening the screw on each connector.
9. Staple the BX cable within 8″ of the outlet box. See Fig. 53-13.

Problem 4

Objective

Using the proper equipment and supplies, prepare and install nonmetallic sheathed cable (Romex).

Equipment

1 claw hammer
1 cable ripper
1 electrician's knife
1 screwdriver

Supplies

1 6′ length No. 12/2 with ground nonmetallic sheathed cable (Romex)
2 2″ Romex staples

Preparing to Work

1. Get the needed equipment and supplies.

Installing Romex Cable

2. Run Romex cable from near the switch box, through the hole in the ceiling joist, and near the octagon outlet box.
3. With a cable ripper cut about 6″ off the outside covering of the insulated wires on both ends of the Romex cable. See

Fig. 53-14. Using Cable Ripper

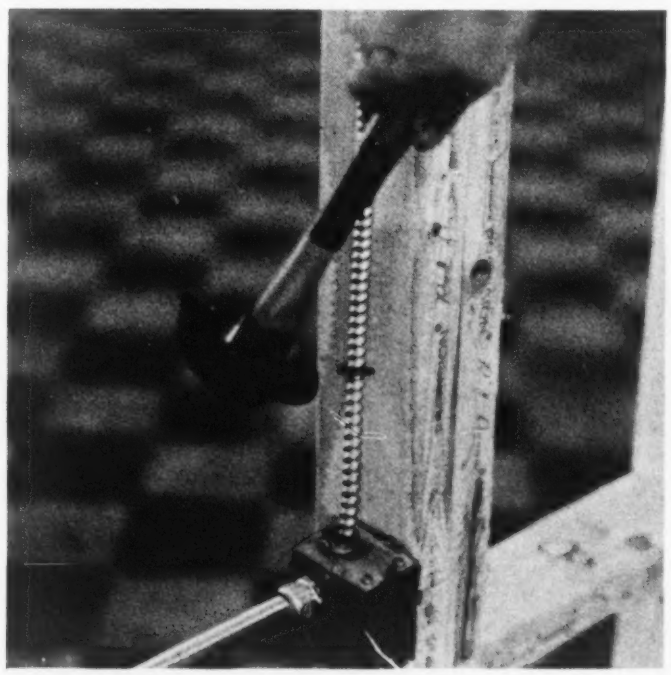

Fig. 53-13. Securing BX Cable to Studding

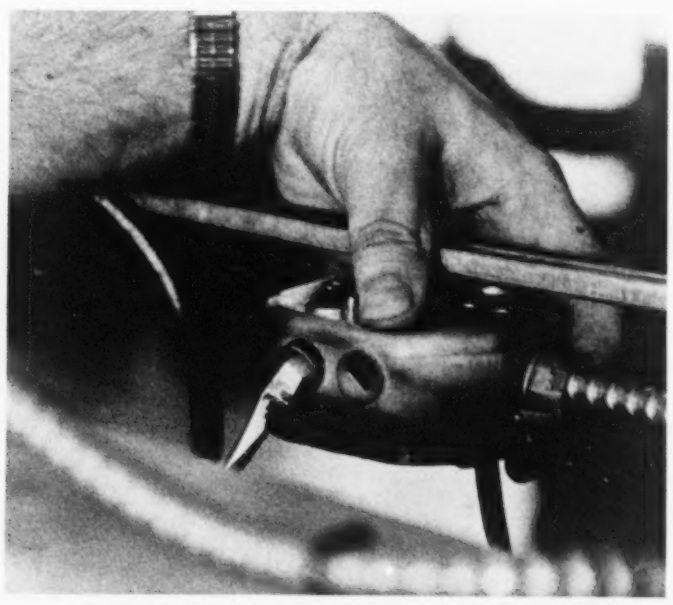

Fig. 53-15. Removing Knock-Out from Octagon Box

Fig. 53-14. Using an electrician's knife, remove the ripped sheathing and insulating paper.

4. Remove the knockout in the top of the switch box and in one side of the octagon box shown in Fig. 53-15.
5. Fasten the wire to each outlet box by running it through a hole and clamping the sheathed cable under a loom clamp. See Fig. 53-16.
6. Staple the Romex to the stud within 8″ of the switch box. This is a requirement of the electrical code. See Fig. 53-17.
7. Staple the Romex to the ceiling joist within 8″ of the octagon outlet box.
8. Loop all wires and depress them (press them down) into boxes. Fixtures will be attached after the walls are enclosed. See Fig. 53-18.

Cleaning Up

9. Return all equipment and supplies, and clean up the work area.

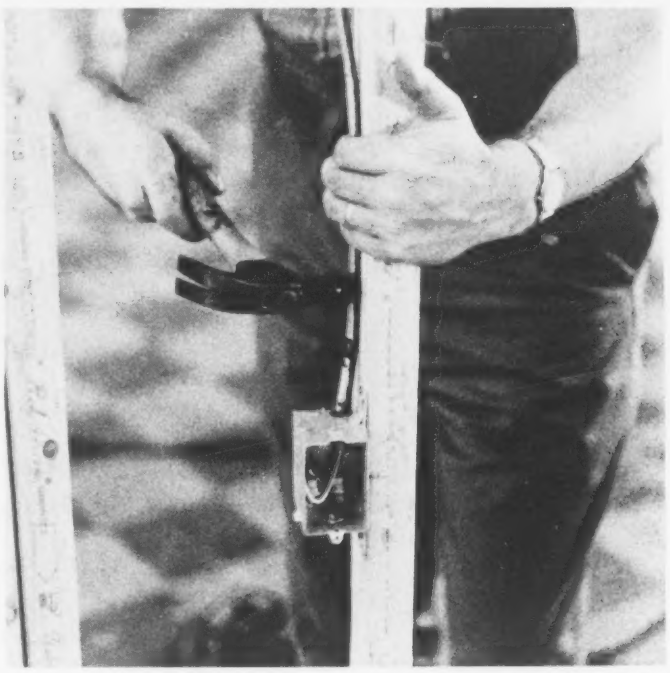

Fig. 53-17. Securing Romex Cable to Studding

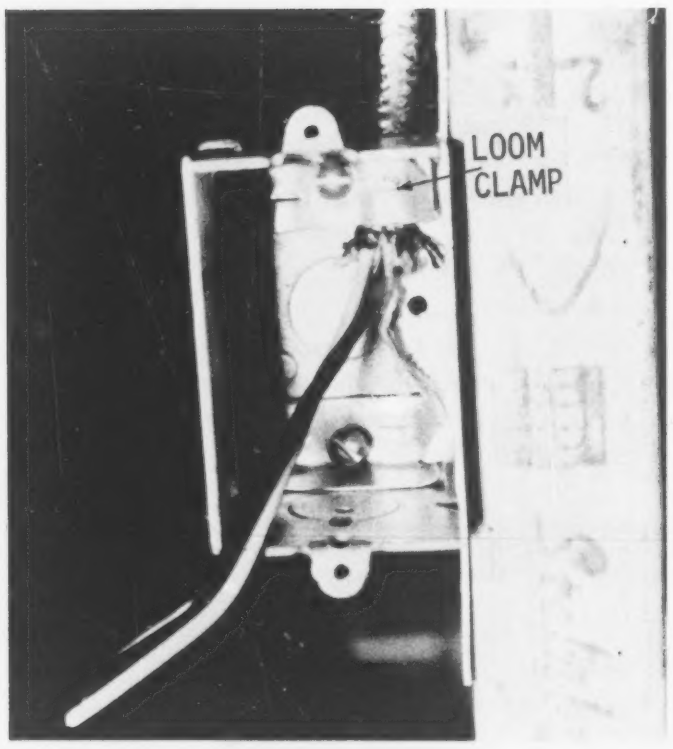

Fig. 53-16. Fastening Romex Cable Under Loom Clamp

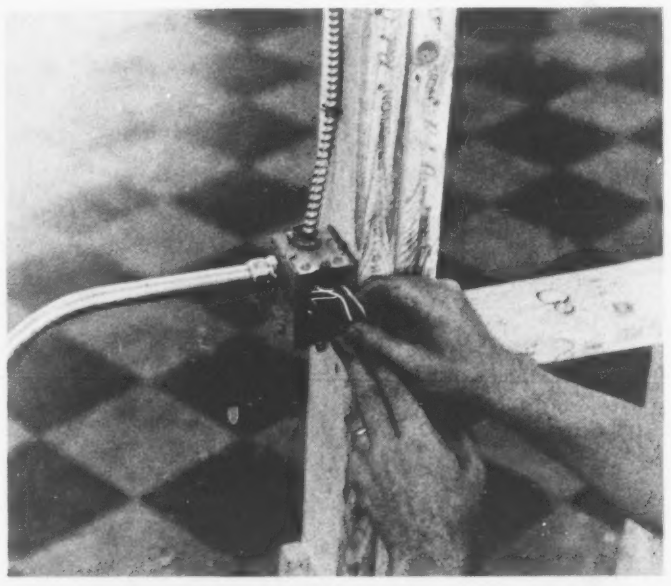

Fig. 53-18. Looping Wires into Outlet Box

ACTIVITY 54

Making Inspections

Today you will complete all rough wiring. Then you will inspect the electrical system in another group's structure. If time permits, you will also inspect the plumbing.

Problem 1

Objective

Using proper equipment and a checklist, inspect the rough wiring in a structure and note corrections needed.

Equipment (Group of 5)

1 steel tape
1 wire gauge, American *or* Brown & Sharpe

Supplies (Group of 5)

1 3″ x 5″ index card
1 thumbtack

Preparing to Work

1. You are to play the part of an inspector. You have been "hired" by a builder to check a rough wiring job. Meet with your regular work group and get the tape and gauge.
2. Each group will inspect another group's structure. Follow your teacher's instructions. Share the inspection tasks.

Inspecting Rough Wiring

3. Check each item on Chart 54-1. (This is a sample checklist. It may not include all local code requirements.)
4. Your foreman should obtain from the teacher a 3″ x 5″ index card which he is to fill out. See Fig. 54-1.

Chart 54-1
Electrical Inspection Sheet

Yes	No	Items to be Checked
____	____	1. Are all wires at least 14 gauge or larger?
____	____	2. Is a staple placed within 8″ of each box outlet or receptacle?
____	____	3. Can all boxes be grounded?
____	____	4. Are all holes drilled at least 1″ from the edge of the studs?
____	____	5. Does only one set of wires pass through each hole in the studs?
____	____	6. Was at least ½″ diameter conduit used, and was it held in place by a clamp?
____	____	7. Is there an insulator in the armored cable?
____	____	8. Are all holes for electrical wiring in the correct location?
____	____	9. Are junction and outlet boxes located correctly according to plan and specifications?
____	____	10. Is the conduit free from kinks that could have damaged a wire?

5. If an item on the inspection checklist fails to meet *any* of the set standards, check "No" to show that it did not pass inspection.
6. When the foreman has completed the inspection card, he is to obtain a thumbtack and attach the card to the narrow wall stud facing.

Problem 2

Objective

Using proper equipment and a checklist, inspect the plumbing system in a structure and note corrections needed.

INSPECTION CARD FOR STRUCTURE NO. _____

Electrical __ } Check one. Plumbing __ }

Passed __ } Check one. Rejected __ }

Correction needed (if any): _____

_____

_____

_____ _____

(Date) Signed (Group Foreman)

Fig. 54-1. Form for Use in Reporting Electrical or Plumbing Inspection
(Form is to be reproduced on 3″ x 5″ card.)

Equipment (Group of 5)
1 steel tape
Supplies (Group of 5)
1 3″ x 5″ index card
1 thumbtack

Inspecting Plumbing

1. Check each item on Chart 54-2.
2. Your foreman should obtain from the teacher a 3″ x 5″ index card which he is to fill out. See Fig. 54-1.
3. If an item on the inspection checklist fails to meet *any* of the set standards, check "No" to show that it did not pass inspection.
4. When the foreman has completed the inspection card, he is to obtain a thumbtack and attach the card to the narrow wall stud facing.

Chart 54-2
Plumbing Inspection Checklist

Yes	No	Items to be Checked
____	____	1. Was the proper sealant (pipe dope) used in threaded joints?
____	____	2. Do soldered joints appear neat, and was excess flux wiped away?
____	____	3. Do all joints appear to be watertight (no leakage)?
____	____	4. Are pipes or fittings securely fastened to the structural frame?
____	____	5. Does the copper tubing appear to be watertight (free from hairline cracks and holes)?
____	____	6. Is the distance between hot and cold water lines less than 10″?

ACTIVITY 55

Mediating and Arbitrating

Today you will take part in a dispute between two unions.

Problem

Objective

Given a jurisdictional dispute, participate as a mediator, arbitrator, and/or union representative.

Mediation

1. Your teacher will give you the details of a jurisdictional dispute. Then some of you will argue the issue and the others will be mediators.

Arbitration

2. The issue will be submitted for arbitration. At a hearing some of you will speak for each side in the dispute and the others will be arbitrators.
3. At the end of the hearing, complete Chart 55-1.

Chart 55-1
Summary of Jurisdictional Dispute and Award Decision

Which of these positions did you hold today?	__ Union representative __ Mediator __ Arbitrator
If you represented a union, which one?	__ Plumbers __ Carpenters
As an arbitrator, to which union would you "award" your decision?	__ Plumbers __ Carpenters
To which group did the majority of the class "award" the decision?	__ Plumbers __ Carpenters

ACTIVITY 56

Enclosing Framed Superstructures

Today three students in your group will do Problem 1 and two students will do Problem 2. Follow your teacher's instructions.

Problem 1

Objective

Using the proper equipment and supplies, prepare and install the wall sheathing on the long wall of your structure.

Equipment (Subgroup: 3 students)

1 compass saw
1 hand brace with No. 12 (¾") auger bit *or*
1 electrical drill with ¾" speed bit
1 steel tape
1 chalkline
2 claw hammers

Supplies (Subgroup: 3 students)

1 pc. ½" x 48" x 56" sheathing
⅛ lb. 6d box nails

Safety Precautions

1. Avoid tipping the structure over.
2. Work carefully.

Preparing to Work

1. Get the equipment and supplies for Problem 1.

Locating Stud-Center Lines

2. Turn the sheet of sheathing so that the 56" dimension runs up and down (vertically). Lean it against the front of the wall section where it is to be applied. See Fig. 56-1.
3. On the top edge of the sheathing mark the locations of stud centers as in Fig. 56-1.
4. Measure and mark the stud centers on the bottom edge of the sheathing as in Fig. 56-1.
5. Hold a chalked line taut between the first pair of stud center marks, and snap it.

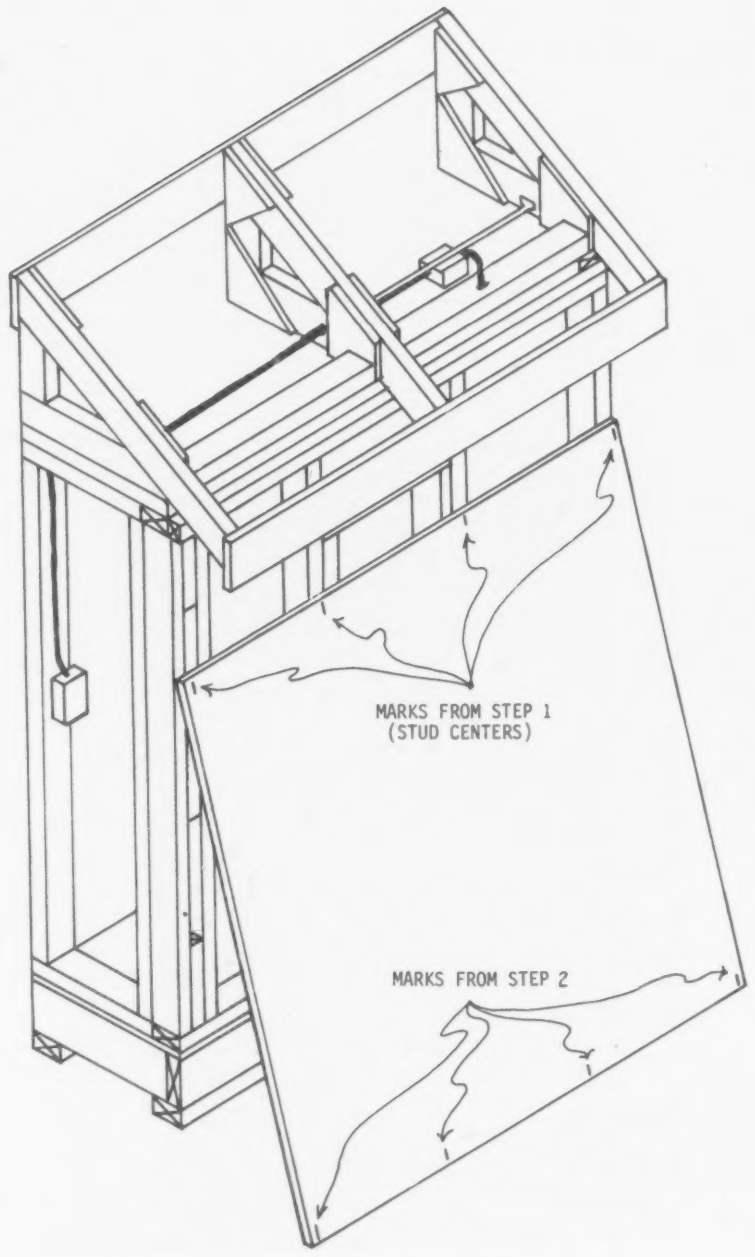

Fig. 56-1. Marking Sheathing

6. Repeat until all stud centers are marked on the sheathing as shown in Fig. 56-2.

Installing Sheathing

7. Hold the sheathing in place and nail it. Use 6d box nails spaced about 12″ apart on each stud, as in Fig. 56-3. *Be sure the sheathing is held about ½″ above the skids.*

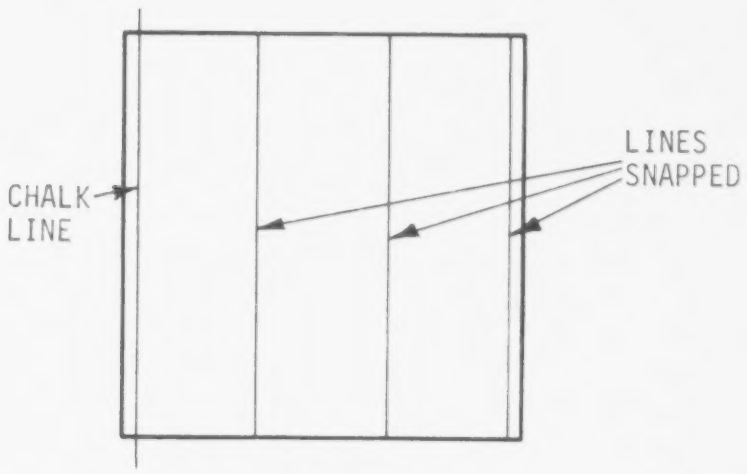

Fig. 56-2. Stud Centers Marked

Fig. 56-3. Nailing Sheathing to Front Wall

Making Window Opening

8. Using either a No. 12 auger bit and brace or a ¾″ spade bit in an electric drill, bore a hole in each corner of the window opening from the inside as shown in Fig. 56-4.
9. With a compass saw, cut the window opening in the sheathing from the inside as shown in Fig. 56-5.

Problem 2

Objective

Using the proper equipment and supplies, prepare and install the wall sheathing on the short wall of your structure.

Fig. 56-4. Boring Starter Holes

Fig. 56-5. Cutting Window Opening

Equipment (Subgroup: 2 students)
1 crosscut saw
1 claw hammer
Supplies (Subgroup: 2 students)
2 pcs. ½″ x 15″ x 48″ sheathing material
⅛ lb. 6d box nails

Preparing to Work

1. Get the equipment and supplies for Problem 2.

Laying Out and Installing Sheathing

2. Hold and nail a ½″ x 15″ x 48″ piece of sheathing in place against the short wall, about ½ off the floor. Space the nails approximately 12″ apart.
3. Hold the other ½″ x 15″ x 48″ piece of sheathing in place above the first piece so that the edges butt together. See Fig. 56-6.
4. Mark the upper piece of sheathing along the top edge of the truss section as in Fig. 56-6.
5. Cut along the marked line with a crosscut saw.
6. Nail the upper piece to the frame with 6d box nails.
7. Using a scrap piece of ½″ sheathing, mark, cut, and nail to fill in the end of the truss overhang.

Cleaning Up

8. Return all equipment and clean the work area.

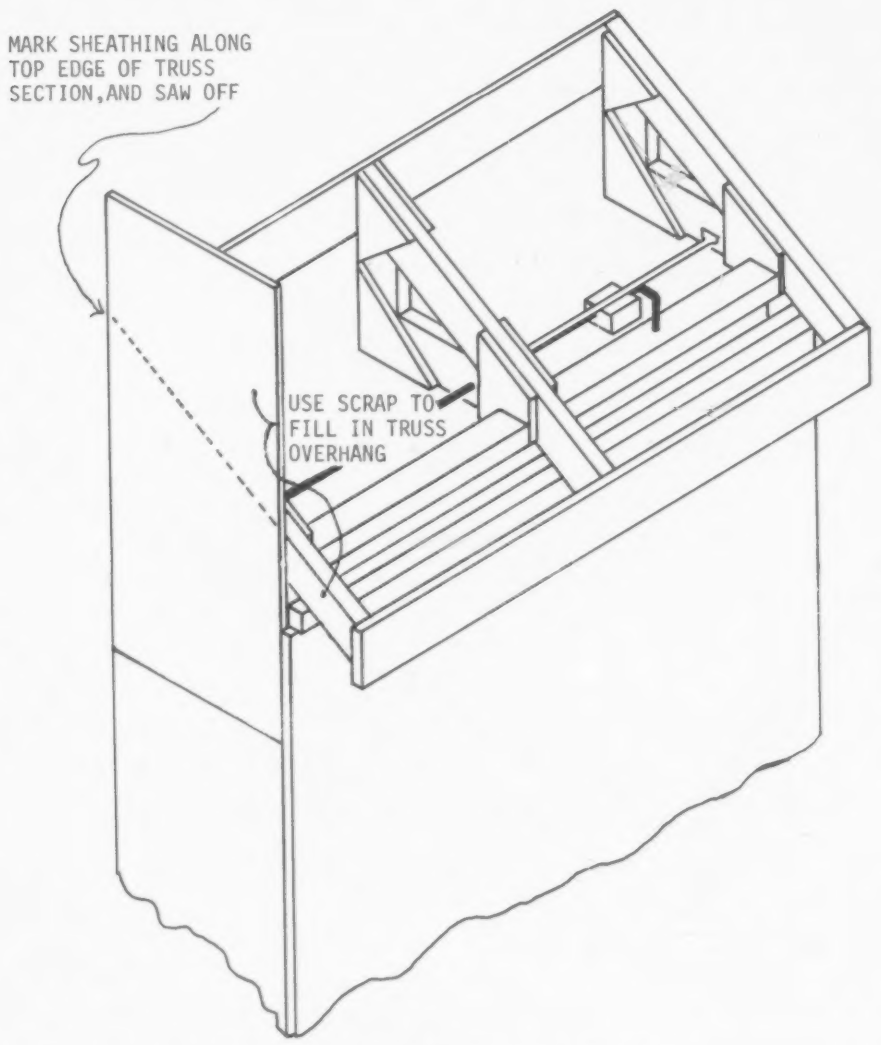

Fig. 56-6. Sheathing Pieces in Position

ACTIVITY 57A

Roofing

Today your group will begin enclosing the roof of your structure.

Problem 1

Objective

Using the proper equipment and supplies, apply roof sheathing, drip edge, and rake edge to the structure.

Equipment (Group of 5)
1 claw hammer
1 chalkline

Supplies (Group of 5)
1 pc. ½" x 24" x 48" sheathing grade (C-D) plywood
1 pc. 50" galv. drip edge (optional)
1 pc. 24" galv. rake edge (optional)
1 pc. ½" x 2¾" x 24" sheathing grade (C-D) plywood
⅛ lb. 6d box nails

Preparing to Work

1. Get the equipment and supplies for your group.

Applying Roof Sheathing

2. Place the large piece of plywood so that

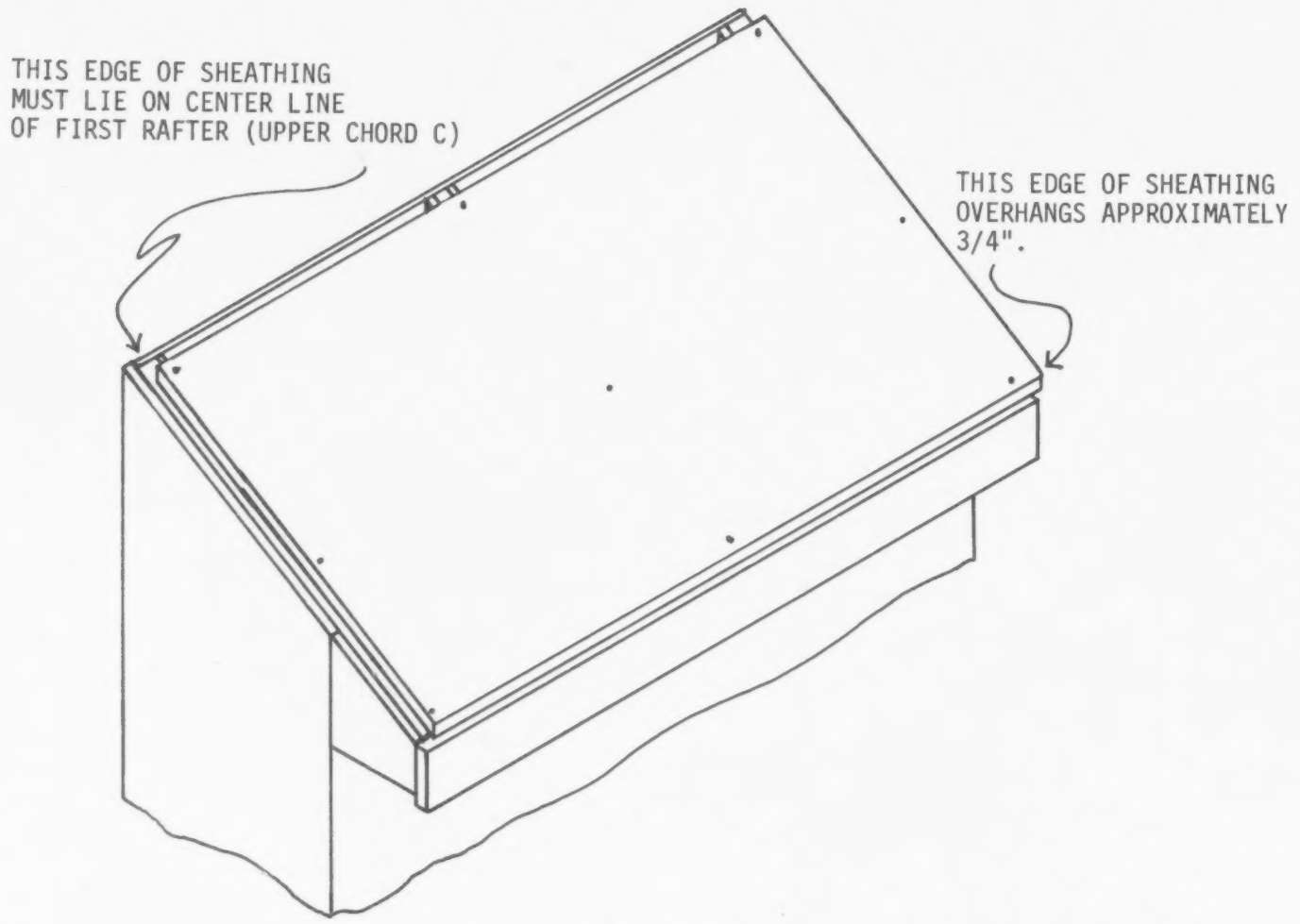

Fig. 57A-1. Applying Large Sheathing Piece to Roof

its left edge lies along the center line of the first rafter (upper chord) as in Fig. 57A-1.

3. Nail the plywood at two corners, and have your teacher check it for accuracy.
4. Snap a chalkline down the roof sheathing to mark the centers of the middle and end rafters. See Fig. 57A-2.
5. Place the 2¾" strip of plywood over the first rafter as shown in Fig. 57A-2, and nail it in place.
6. Finish nailing the large sheathing piece to all three rafters.

Installing Drip and Rake Edges (Optional)

7. Nail the drip edge in place with three 6d galvanized nails. Be sure the drip edge is even with the outside corner of the ½" x 2¾" x 24" sheathing strip. See Figs. 57A-2 and 57A-3.
8. Nail the rake edge in position with 3 nails. See Figs. 57A-2 and 57A-3.

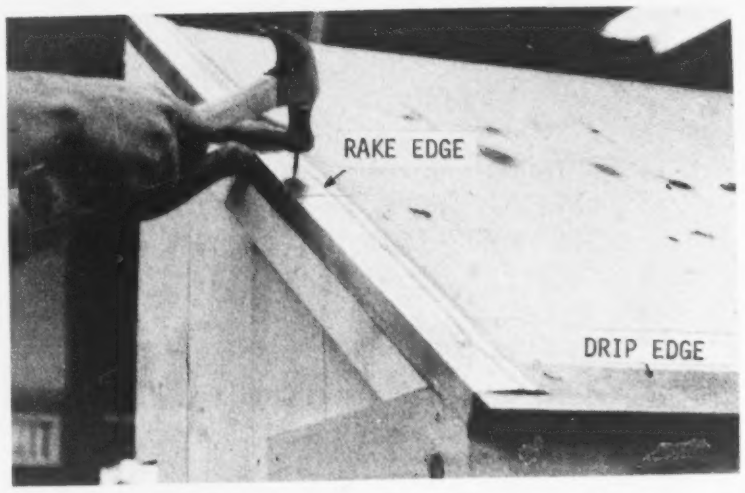

Fig. 57A-3. Nailing Galvanized Edge and Rake in Position

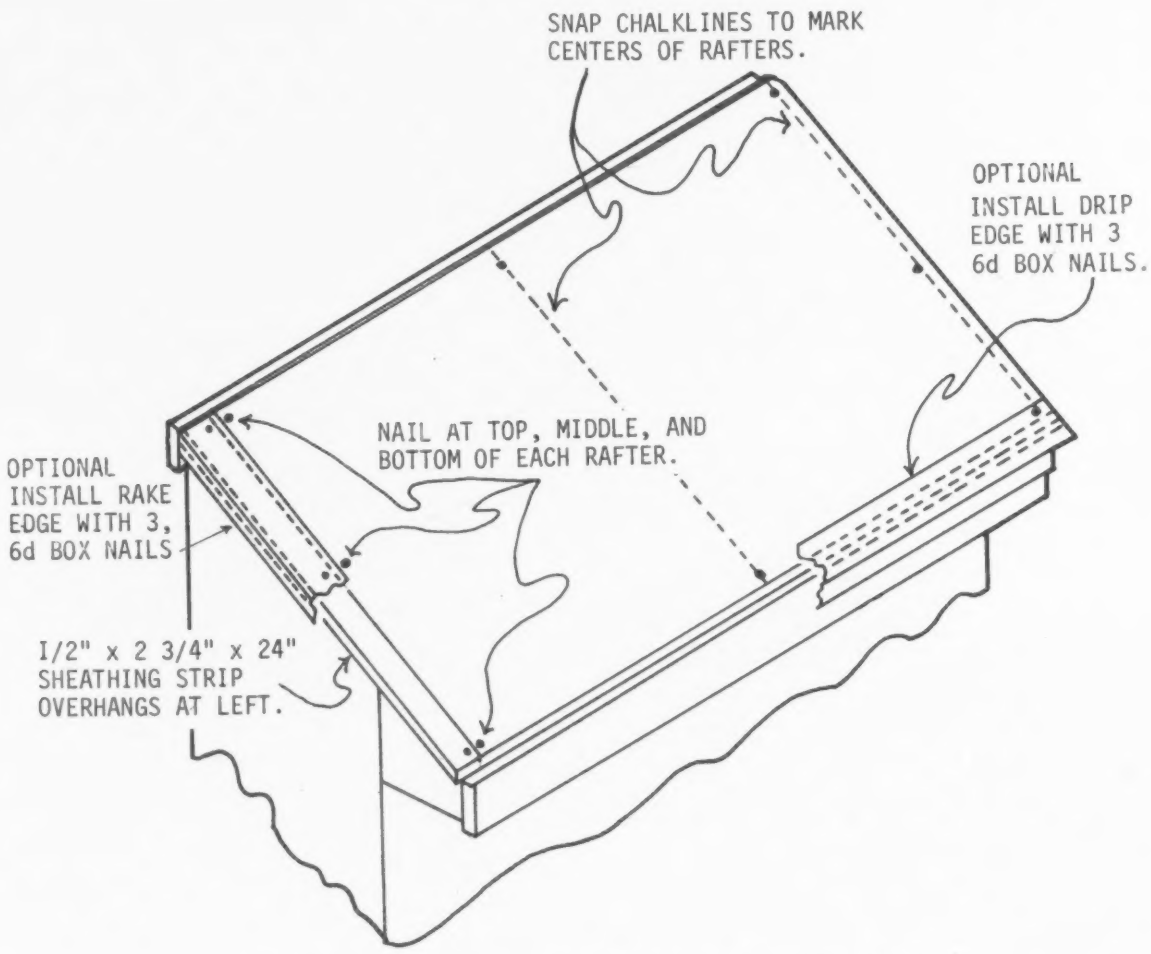
SNAP CHALKLINES TO MARK CENTERS OF RAFTERS.
OPTIONAL INSTALL DRIP EDGE WITH 3 6d BOX NAILS.
NAIL AT TOP, MIDDLE, AND BOTTOM OF EACH RAFTER.
OPTIONAL INSTALL RAKE EDGE WITH 3, 6d BOX NAILS
I/2" x 2 3/4" x 24" SHEATHING STRIP OVERHANGS AT LEFT.

Fig. 57A-2. Completing Sheathing Installation on Roof

Problem 2

Objective

Using the proper equipment and supplies, cut and apply building felt to the roof of the structure.

Equipment (Group of 5)

1 utility knife
1 steel tape
1 staple gun with $\frac{9}{16}$" staples

Supplies (Group of 5)

1 pc. 36" x 54", 15 lb. building felt
1 pc. scrap wood, for cutting surface

Preparing to Work

1. Get the needed equipment and supplies.

Applying Building Felt

2. Measure the overall length and width of the roof. Include the top surface of the ridge board and the fascia board.
3. Lay the sheet of building felt over a scrap piece of wood on a workbench or on the floor. Measure and cut it to proper size with a utility knife.
4. Position the building felt on the roof, and secure it with a staple gun.

Cleaning Up

5. Return all tools, and clean up the work area.

ACTIVITY 57B

Roofing

Today three students in your group will apply roof shingles. A window frame, which will be installed in a future activity, will be assembled by two other students.

Problem 1

Objective

Using the proper equipment and supplies, apply three courses of a shingle roof to your structure.

Equipment (Subgroup: 3 students)
1 utility knife
1 claw hammer
1 steel tape
1 chalkline

Supplies (Subgroup: 3 students)
½ lb. ½" galv. roofing nails
6 12" x 36" asphalt shingles
1 pc. 9" x 52¼" starter strip (cut from roll)

Preparing to Work

1. Get the needed equipment and supplies.

Laying Out Roof for Shingles

2. Measure and mark the top and bottom edge of the roof 35¼" from the left (closed) end of the structure. See Fig. 57B-1.
3. Measure 6" to the right of your first marks at both the top and bottom of the roof, and mark these points. See Fig. 57B-1.

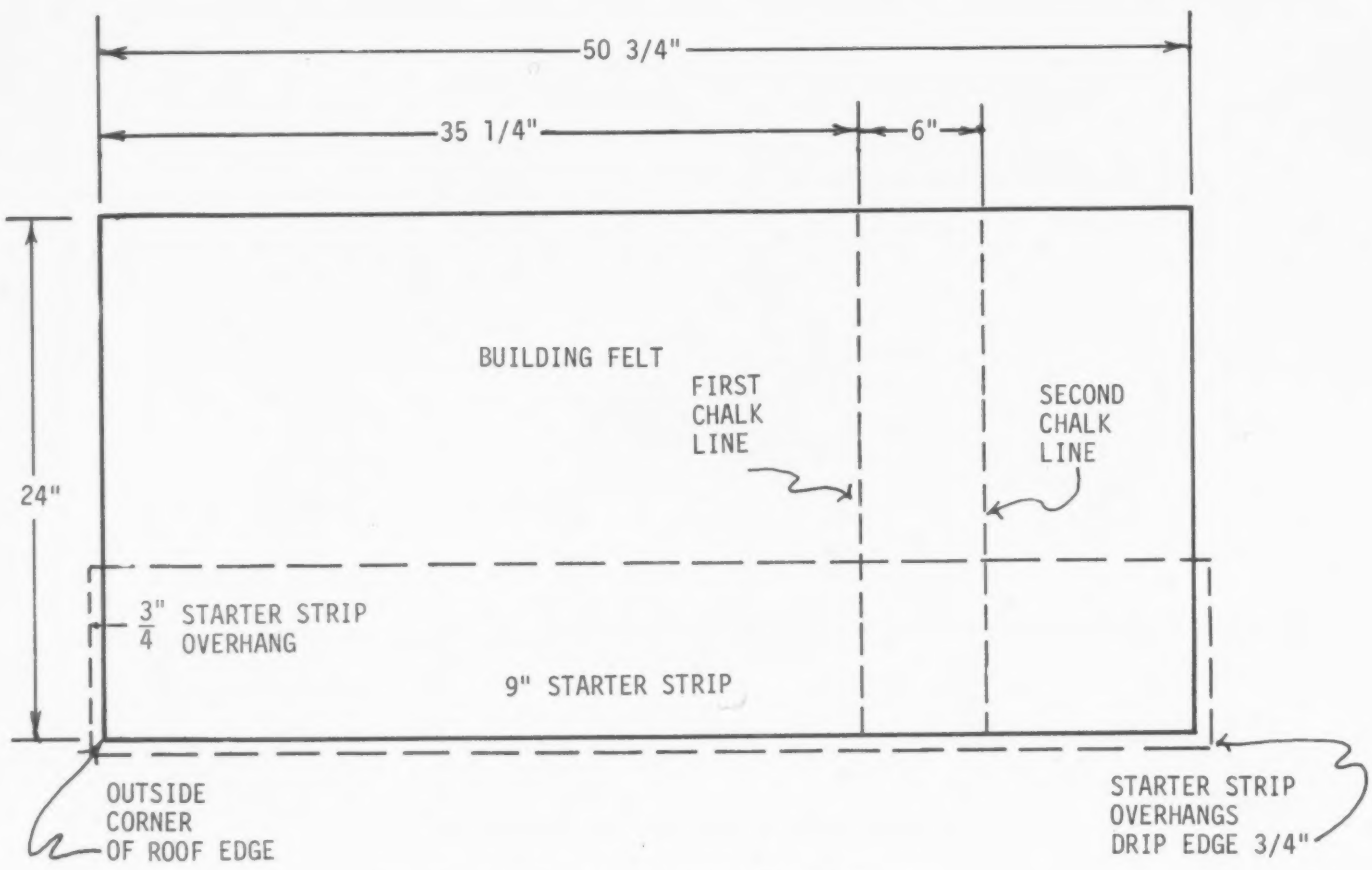

Fig. 57B-1. Roof Section Laid Out for Shingles

4. Snap a chalkline between each pair of marked points.

Shingling

5. Nail a 9″ starter strip on the plywood so that it overhangs the roof by ¾″ *on each end and the bottom.* If a starter strip is not available, use two shingles as demonstrated by your teacher.
6. Start your first course of shingles from the first chalkline (35¼″ mark). Lay one *full* shingle to the left of the line.
7. Cut a shingle to fit the space to the right of the line. Cut it off so it overhangs the end of the roof ¾″.
8. Nail the shingles in place. Locate the nails as shown in Fig. 57B-2. *Remember: Do not drive nails in the 2″ overhang, and do not drive nails completely in.*
9. The second course of shingles is started 6″ to the right of the first course. Start on the second chalkline. Lay one *full* shingle to the left of the line.
10. Using the leftover shingle from the first course, cut pieces to fit at each end of the second course.
11. Measure and lay out the second course, leaving the first course 5″ to the weather. Nail in place. See Fig. 57B-3.
12. Measuring 5″ to the weather, lay out, cut, and nail the third course in the same position as the first course.
13. Return your equipment.

Fig. 57B-2. Location of Nails on Shingles

Problem 2

Objective

Using the proper equipment and supplies, assemble a window frame for your structure.

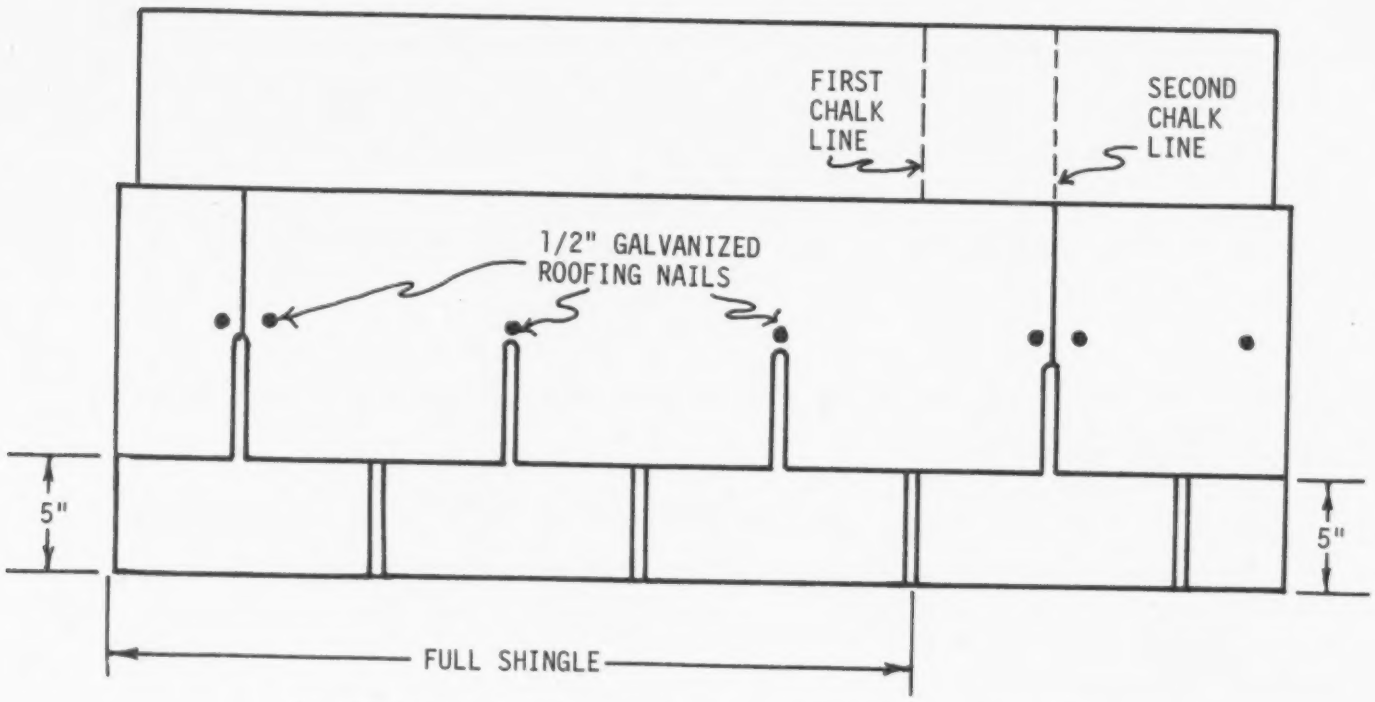

Fig. 57B-3. First Two Courses of Shingles Laid 5″ to the Weather

Equipment (Subgroup: 2 students)
1 claw hammer
1 nail set
1 level

Supplies (Subgroup: 2 students)
2 pcs. 3/4" x 4 5/8" x 16 3/8" wood (window frame sides)
1 pc. 3/4" x 4 5/8" x 11" wood (window frame top)
1 pc. 3/4" x 6 3/8" x 14" wood (sill)
2 pcs. 3/4" x 2 1/4" x 16 1/2" wood (side trim)
1 pc. 3/4" x 2 1/4" x 14" wood (top trim)
1 pc. 3/4" x 2 1/2" x 14" wood (interior sill)
1/2 lb. 8d finish nails
12 8d box nails

Preparing to Work

1. Get the needed equipment and supplies.

Assembling Window Frame

2. Figure 57B-4 shows how to nail the window frame top, sides, and sill to form the finished opening. Use 8d box nails.
3. Check the fit of the two pieces of side trim. When they fit properly, nail them in place using 8d finish nails. See Fig. 57B-5.
4. Complete the window frame unit by nailing the top trim and interior sill in place as shown in Fig. 57B-5, using 8d finish nails.
5. Set all finish nails.

Cleaning Up

6. Return your equipment. All students should help clean the work area.

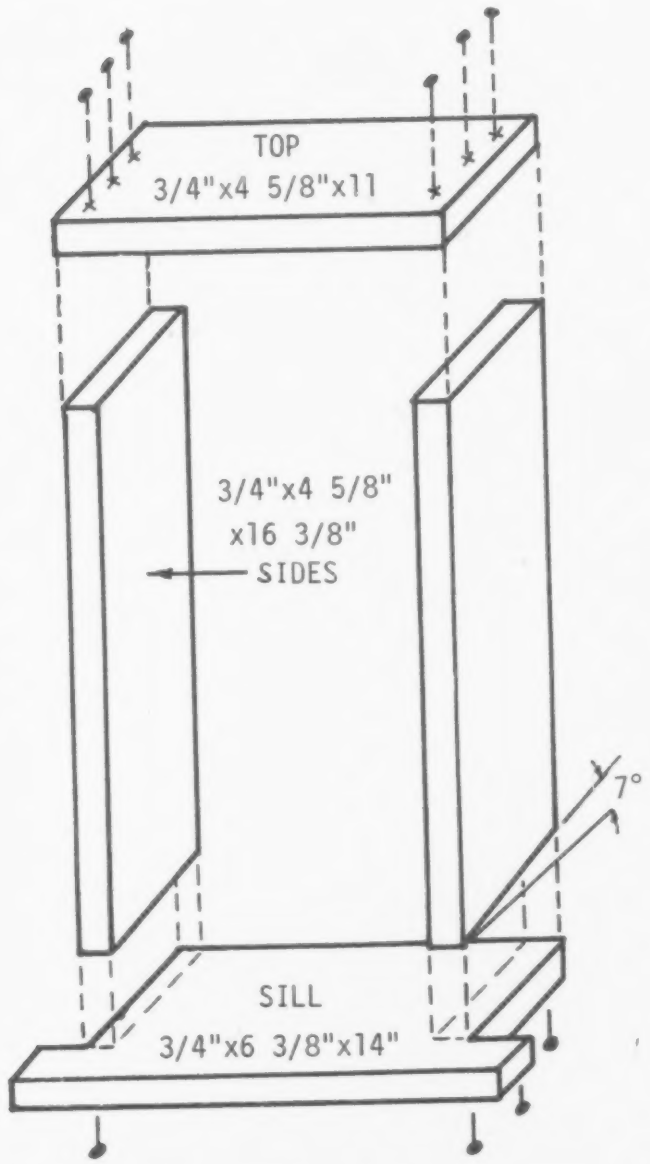

Fig. 57B-4. Assembly of Window Frame

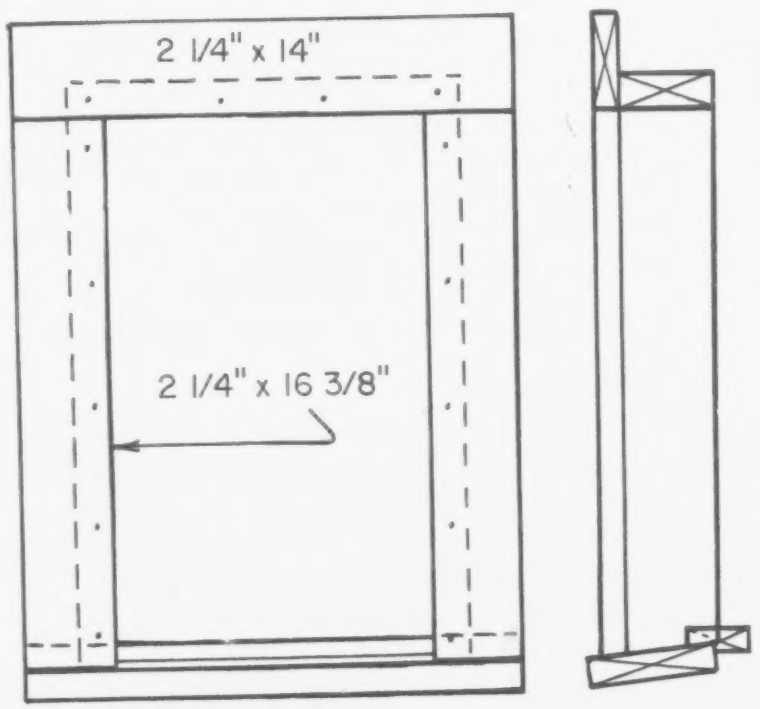

Fig. 57B-5. Nailing Trim to Frame

ACTIVITY 58A

Enclosing Exterior Walls

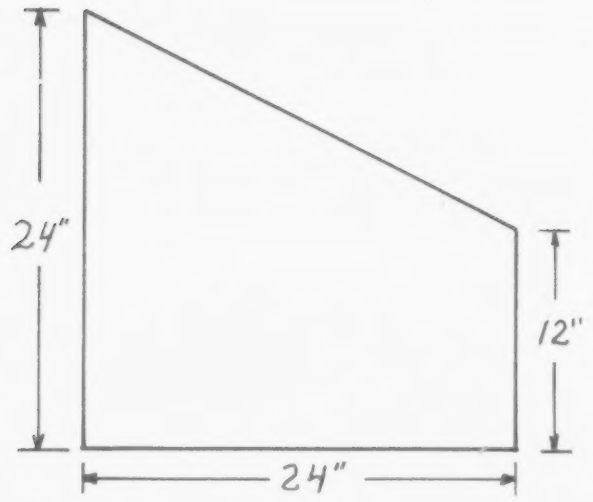

Fig. 58A-1. Building Felt Piece for Roof Truss Section of Short Wall

Now that the roofing is completed, you will apply siding on the outside of the structure.

Problem 1

Objective

Using the proper equipment and supplies, apply building felt to the exterior walls.

Equipment (Group of 5)

1 staple gun/staples
1 steel tape
1 utility knife

Supplies (Group of 5)

3 pcs. 15 lb. building felt as follows:
1 strip 36″ x 72″
1 strip 18″ x 72″
1 pc. to cover roof truss end
(See Fig. 58A-1.)

Safety Precaution

Never point a staple gun at any portion of anyone's body.

Preparing to Work

1. Get the needed equipment and supplies.

Applying Felt

2. Hold the 36″ x 72″ strip of building felt against the bottom of the wall section with the 72″ dimension running horizontally (across). See Fig. 58A-2. The felt should clear the floor by about ½″.
3. Starting at the bottom of the structure, staple the felt to both walls.
4. Hold the 18″ x 72″ felt strip against the front wall section with its top edge

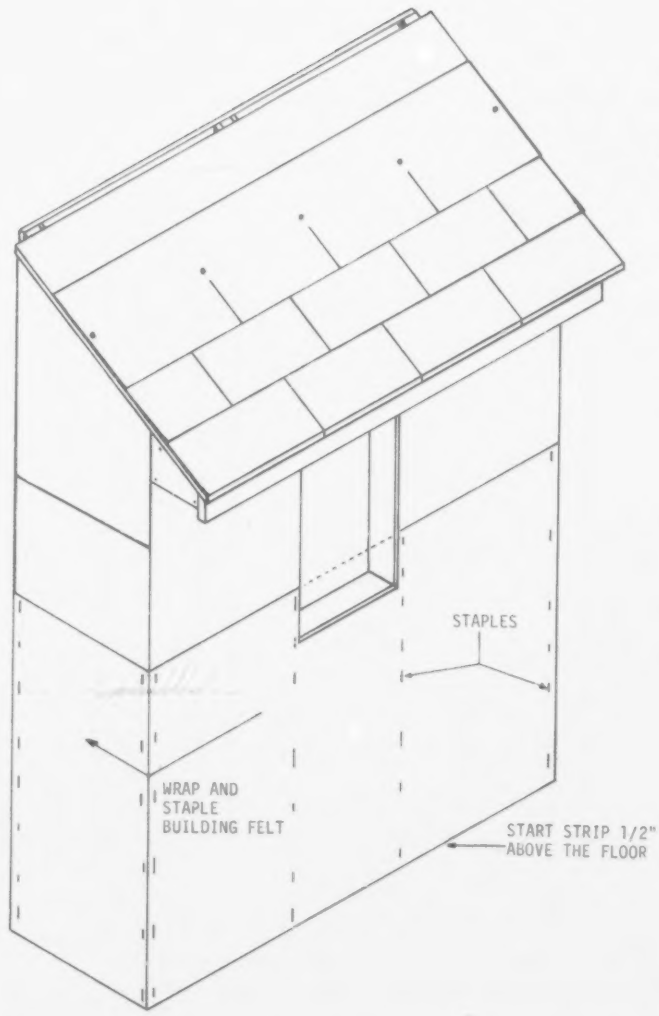

Fig. 58A-2. Bottom Strip of Building Felt Stapled to Front and Side Walls

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against the soffit nailer as in Fig. 58A-3. It should overlap the first strip about 3″. Staple it in place, starting at the top right corner.

5. Hold the roof truss section of building felt in place, allowing it to overhang on all edges.
6. Staple it to the wall, and trim overhanging edges.
7. Staple the felt around the top, sides, and bottom of the window opening.
8. With the utility knife, cut away the felt that covers the window opening.

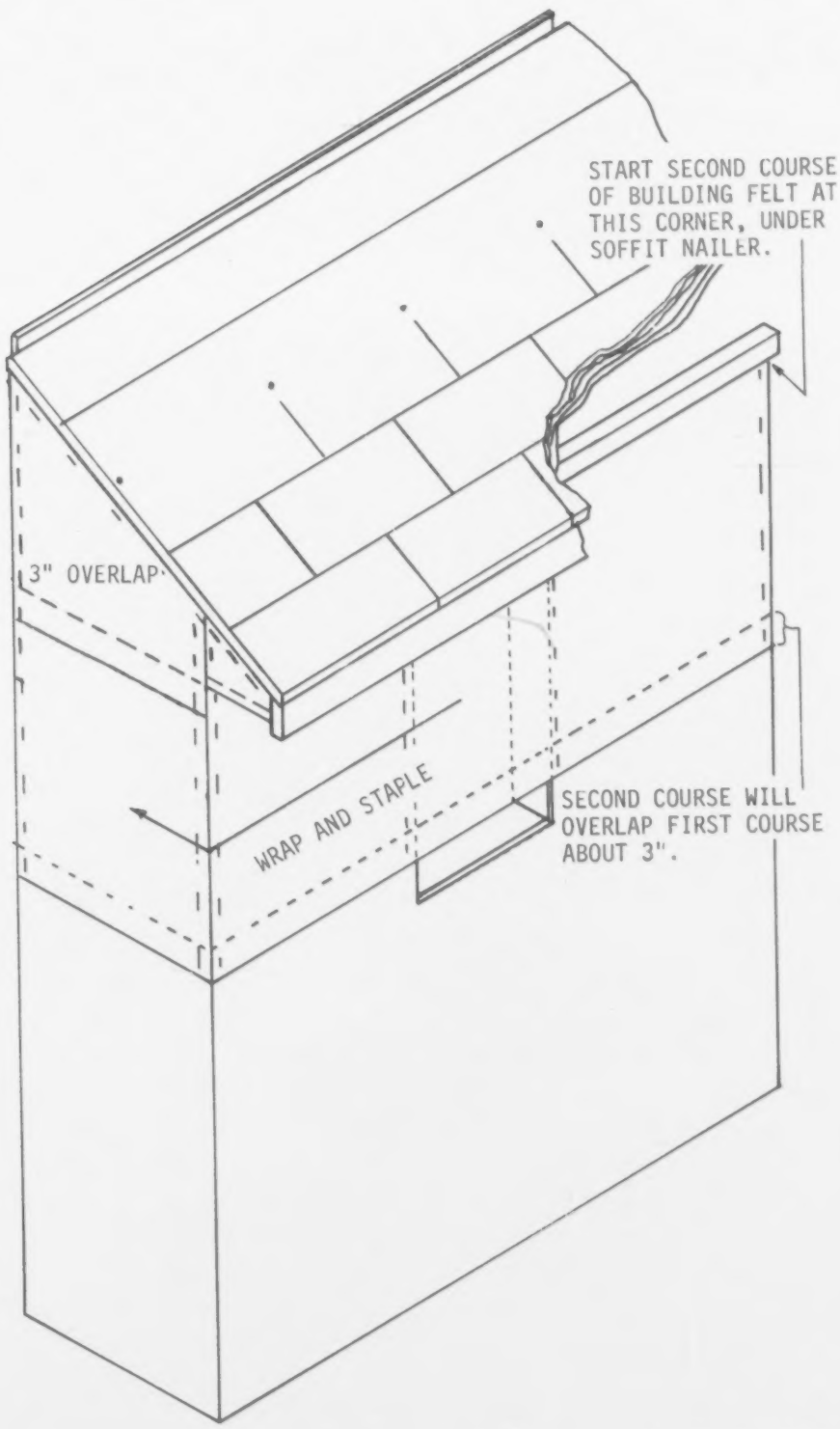
START SECOND COURSE OF BUILDING FELT AT THIS CORNER, UNDER SOFFIT NAILER.
3" OVERLAP
WRAP AND STAPLE
SECOND COURSE WILL OVERLAP FIRST COURSE ABOUT 3".

Fig. 58A-3. Applying 18″ Strip of Building Felt (Roof structure is cut away to show detail.)

Problem 2

Objective

Using the proper equipment and supplies, measure, cut, and install the corner board and vertical siding on the gable end of your structure.

Equipment (Group of 5)

1 crosscut saw
2 claw hammers
1 framing square

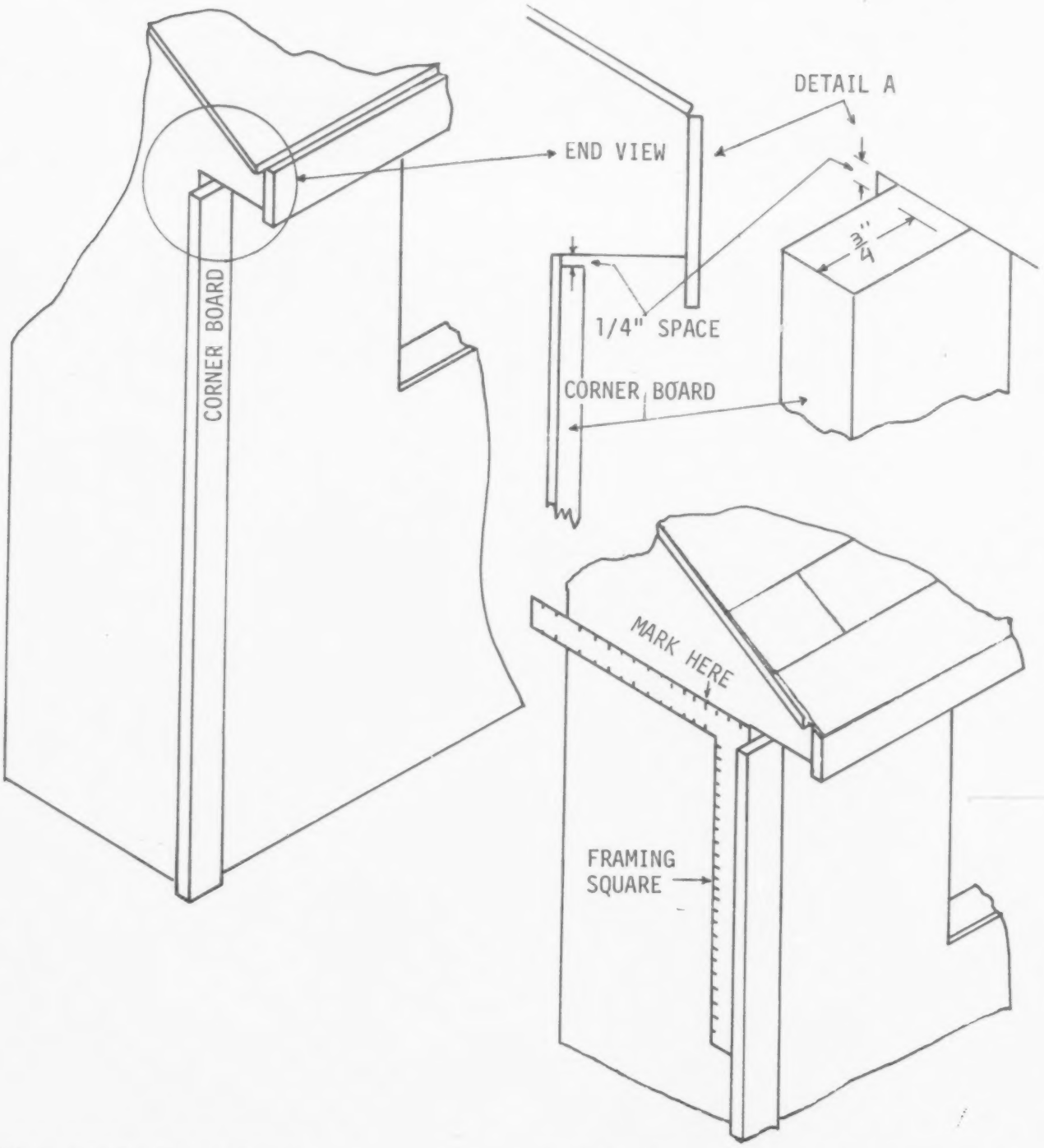

Fig. 58A-4. Installing Corner Board

Fig. 58A-5. Layout Guide Line for Bottom of Vertical Siding

Supplies (Group of 5)
- 1 pc. 1″ x 6″ x 48″ (minimum) V-joint (T&G) siding
- 1 pc. 1″ x 4″ x 55¼″ W.P. or equiv.
- 1 pc. ¾″ stock, for use in fitting corner board (scrap siding)
- ¼ lb. 8d box nails

Preparing to Work

1. Get the needed equipment and supplies.

Positioning and Nailing Corner Board

2. Check to be sure your corner board measures exactly 55¼″ or 4′ 7¼″.
3. Hold the corner board in position as shown in Fig. 58A-4. Leave a ¼″ space at the top between the corner board and the 2″ x 2″ nailer, and let the corner board extend ¾″ beyond the corner of the structure. (You can use a scrap of ¾″ stock as a guide.) Nail the board in place with 8d box nails.

Laying Out, Cutting, and Installing Vertical Siding

4. Square a horizontal line across the short wall of your structure ¼″ above the top of the corner board as shown in Fig. 58A-5.
5. Figure 58A-6 shows how to place a framing square on a siding board, to mark for cutting the angle at the top. Mark, as shown, along the top edge of the framing square tongue.
6. Check to be sure that the groove edge is shorter than the tongue edge. Then cut the board as marked.
7. Hold the siding in place as in Fig. 58A-7, and mark it on the back surface.
8. Cut the board to length, and install by face nailing with 8d box nails at the top and bottom only.
9. Repeat Steps 5 through 8 as you mark, cut, and install the other three siding pieces. Note: The groove side of each piece of siding will be the same length as the tongue side of the piece next to it.

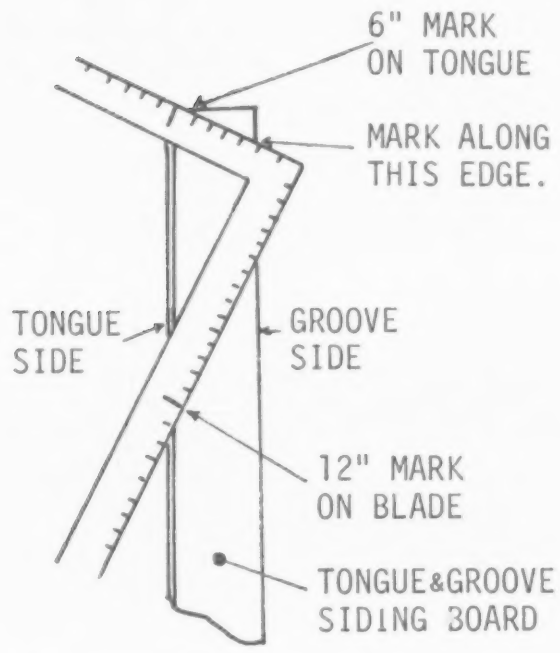

Fig. 58A-6. Framing Square in Place: Tongue Edge Defines Slant of Line to be Marked for Saw Cut

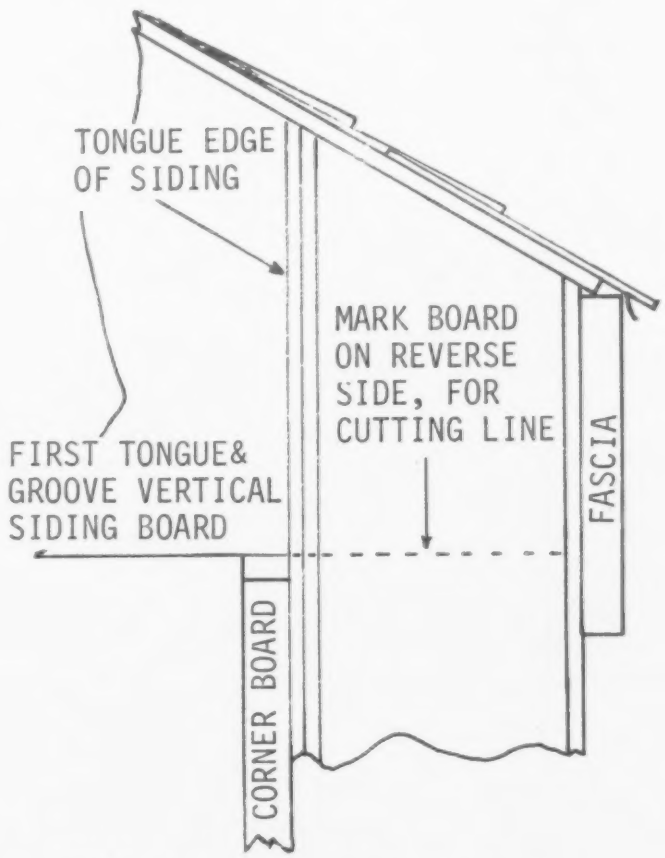

Fig. 58A-7. Marking Siding to Correct Length

10. Figure 58A-8 shows the top part of the short wall with all vertical siding installed. Your structure should now look like this.

Cleaning Up

11. Return all equipment, and clean the work area.

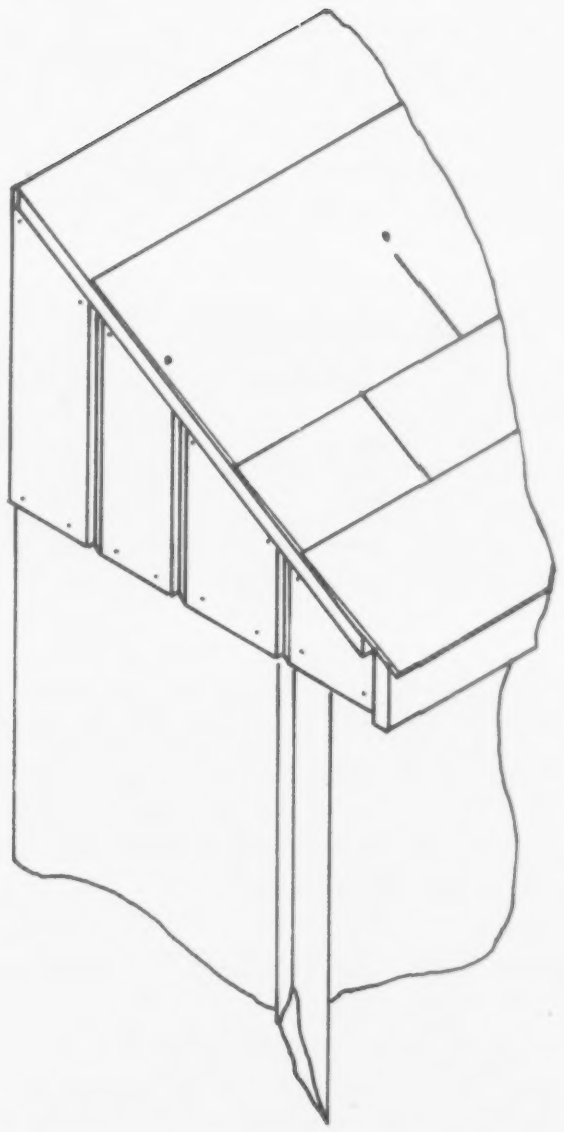

Fig. 58A-8. Vertical Siding Installation Completed

ACTIVITY 58B

Enclosing Exterior Walls

Today you will install the soffit, the return fascia, and the rake on your structure.

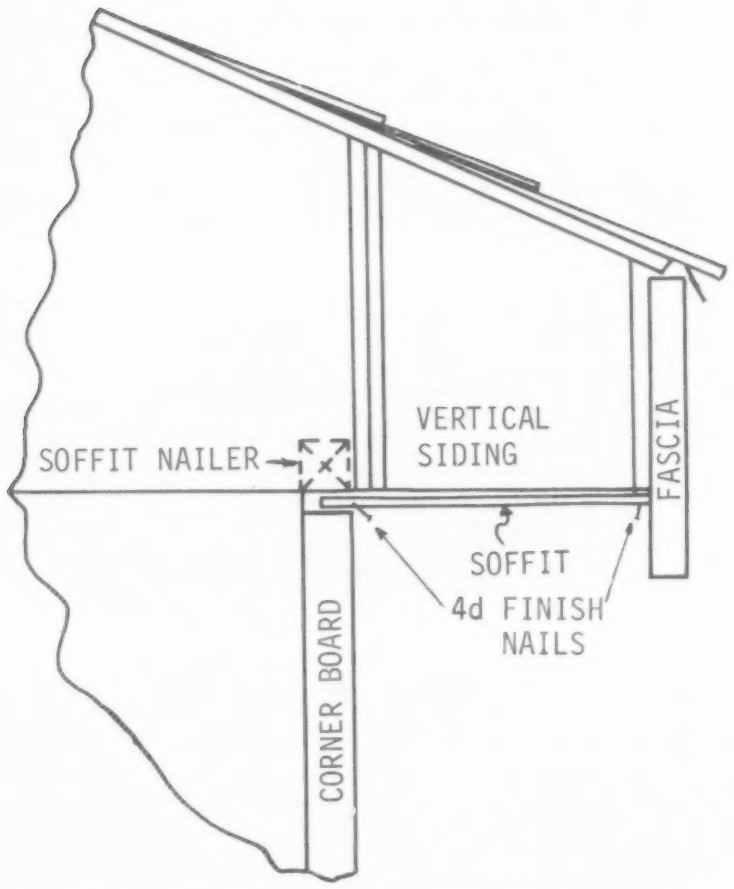

Fig. 58B-1. Soffit in Place Behind Front Fascia

Problem 1

Objective

Using the proper equipment and supplies, install soffit.

Equipment (Subgroup: 2 students)

1 claw hammer
1 nail set

Supplies (Subgroup: 2 students)

1 pc. ¼" x 5½" x 48" plywood
¼ lb. 4d finish nails

Preparing to Work

1. Get the needed equipment and supplies.

Installing Soffit

2. Place the ¼" plywood (soffit) behind the fascia board. Slide one end into the space above the corner board. See Fig. 58B-1.
3. Hold the soffit in position. Use 4d finish nails to secure it to the bottoms of the rafters and to the nailer.
4. Use a nail set to set the nails below the surface. See Fig. 58B-2.

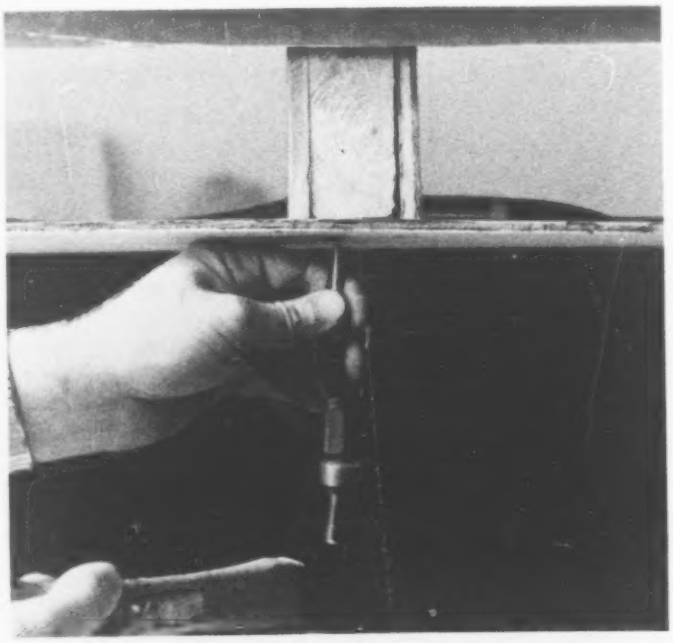

Fig. 58B-2. Setting Finish Nails in Soffit (Fascia has been removed to show how the nail set is held.)

Problem 2

Objective

Using the proper equipment and supplies, lay out, cut, and install return fascia and rake.

Equipment (Subgroup: 3 students)
2 claw hammers
1 crosscut saw
1 steel tape
1 nail set
1 T-bevel
1 block plane

Supplies (Subgroup: 3 students)
¼ lb. 8d finishing nails
1 pc. 1″ x 6″ x 24″ lumber (No. 2 W.P. or equiv.)
1 pc. 1″ x 2″ x 30″ lumber (No. 2 W.P. or equiv.)

Preparing to Work

1. Get the needed equipment and supplies.

Installing Return Fascia

2. Place the 6″ board on the short wall so that it meets the other fascia board as in Fig. 58B-3.
3. Mark and cut this return fascia piece to extend from the front fascia to the back of the structure.
4. Check the fit of the butt joint and adjust it with the block plane as needed.
5. Use 8d finish nails to install the return fascia. Set all nails.

Installing Rake

6. Use a sliding T-bevel to find the rake angle.
7. Lay out the rake angle on one end of the 2″ board. See Fig. 58B-3.
8. Cut the angle as marked. Check the fit of the joint. Adjust it if necessary with a block plane to get a good fit.
9. Hold the rake in place. Mark the other end flush with the vertical siding at the back edge.
10. Cut on the marked line.
11. Install the rake with 8d finish nails. Set all nails.

Cleaning Up

12. Return the equipment. All students should help clean the work area.

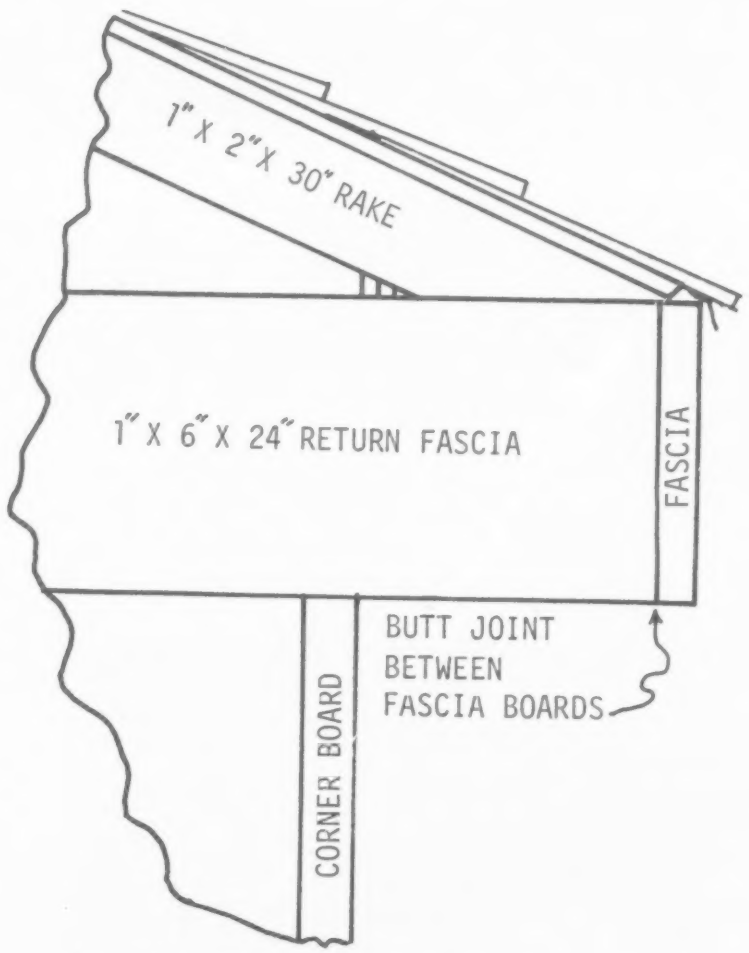

Fig. 58B-3. Return Fascia and Rake Are in Place on Short Wall

ACTIVITY 59

Striking

Problem 1

Objective

Using the proper equipment and supplies:

a. Install a window frame unit.
b. Bend and install flashing over the window frame.

Equipment (Group of 5)

1 claw hammer
1 pr. aviation snips
1 level
1 rule
1 nail set
1 scribe
1 bar fold
or
2 C-clamps
and
1 wooden mallet

Supplies (Group of 5)

1 window frame unit (from Activity 57B)
4 8d finish nails
2 ½" No. 18 galvanized or aluminum roofing nails
1 pc. 6" x 16", 20 gauge sheet metal for flashing

Preparing to Work

1. Get all equipment and supplies.

Installing Window Unit

2. Check your structure to be sure that it is level and resting firmly.
3. Insert the window unit into the opening. Plumb and level it into position. See Fig. 59-1.
4. Nail the window in place with two 8d finish nails on each side. See Fig. 59-1.
5. Set all nails below the surface of the wood.

Installing Flashing over Window

6. Using the rule and scribe, lay out the

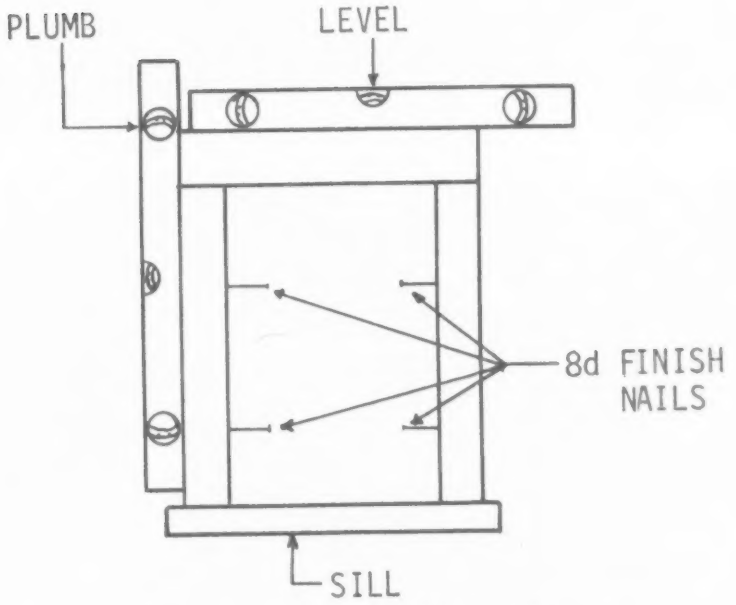

Fig. 59-1. Plumbing and Leveling Window Frame

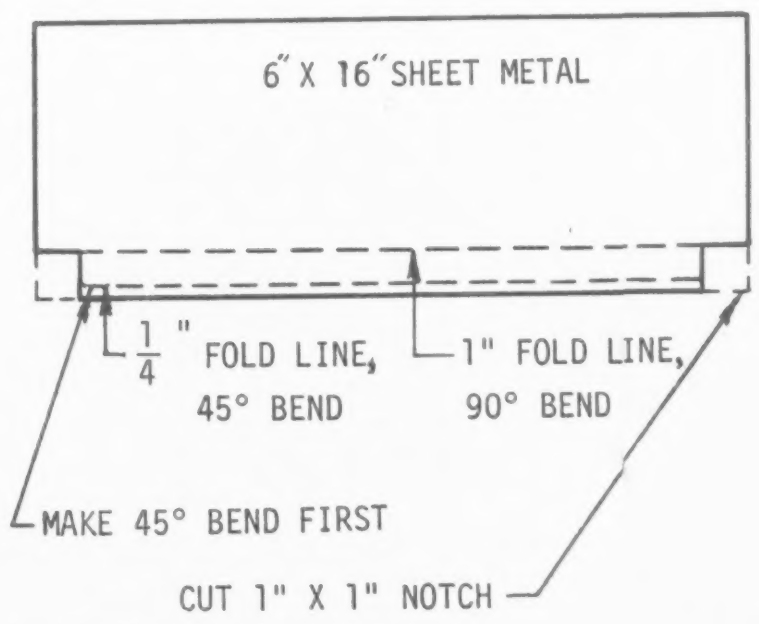

Fig. 59-2. Laying Out Bend Lines

bend lines on the sheet metal piece. See Figs. 59-2 and 59-3.
7. Cut out 1″ x 1″ notches.
8. Bend the flashing either by using a bar folder or by clamping the flashing to a piece of wood and bending the folds with a mallet. See Fig. 59-3.
9. Install the flashing by driving two roofing nails through the sheathing. See Fig. 59-3.

Cleaning Up

10. Return all equipment, and clean the work area.
11. The remaining time, after putting things in order, will be spent in role playing the strike situation described in Problem 2.

Problem 2

Objective

Given a fictional labor-management dispute which resulted in a strike, participate as a negotiator, an observer, or a member of a picket line.

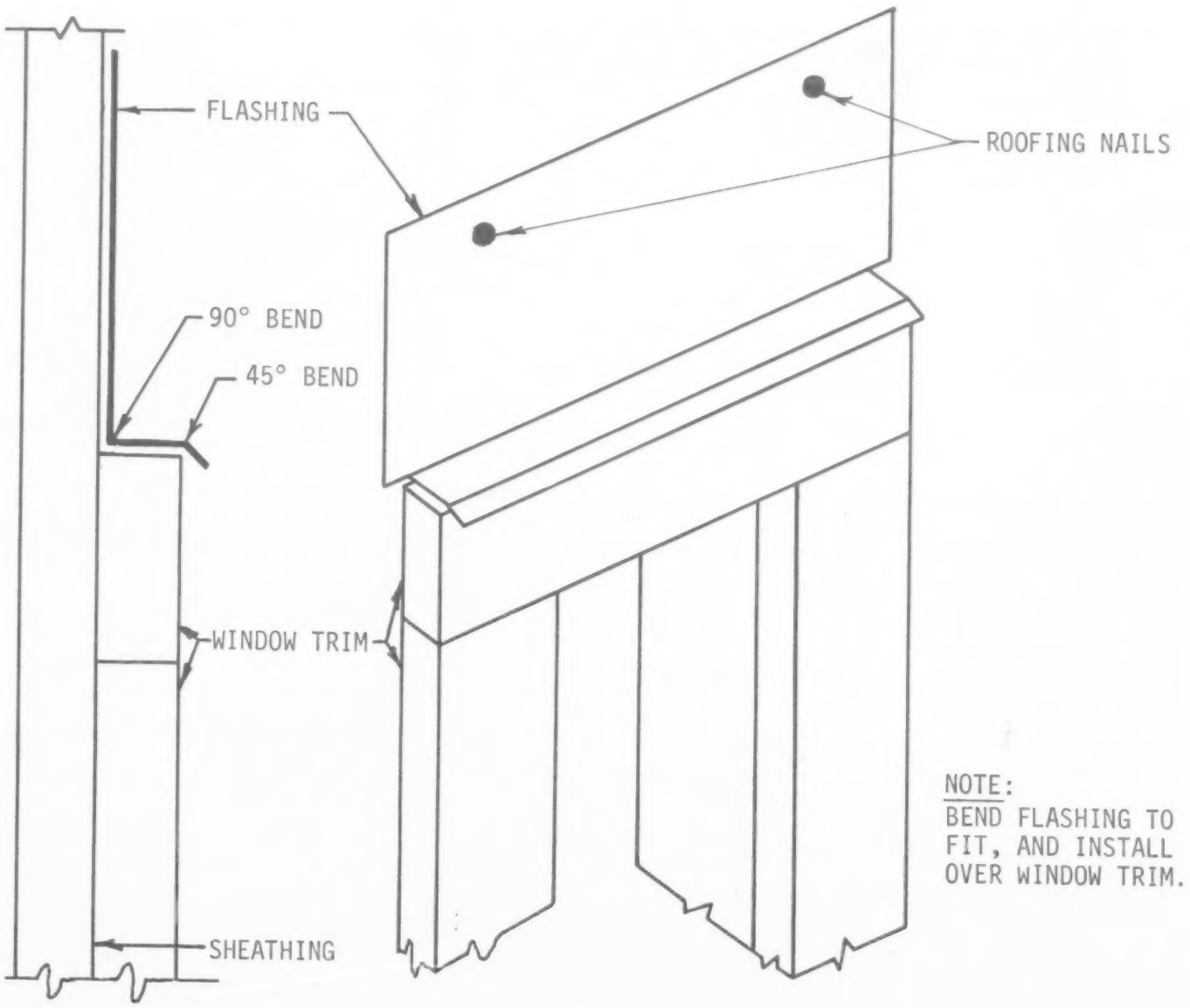

Fig. 59-3. Flashing Installation

Preparing to Solve the Dispute

1. Read the strike situation from the viewpoints of both management and labor.
2. Carry out the roles assigned by the teacher in an attempt to solve the dispute.

Strike Situation

Management's position

As foremen we are responsible for the quality of work done on the construction site. We are also responsible for meeting the scheduled deadlines. We have found over the last few weeks that the quality of workmanship has been decreasing, and errors are being made in the structure. We also have been falling behind in our work schedule.

We have met with the labor representative and have suggested that labor work on weekends at no wages to correct errors the workers have made. This will increase the quality of the work. We have also asked that labor work weekends to help get us back on schedule.

The issue has been through mediation and arbitration, but no agreement has been reached. Labor has gone on STRIKE.

Labor's position

As skilled construction workers we have been doing our jobs in accordance with standard practices. We have done our jobs according to the foremen's directions. If mistakes have been made, they are due to less than adequate management. We will not work on weekends for less than time and a half. This is according to our contract. We have met with management about the issue but with no satisfaction. The issue has been carried through mediation and arbitration, but no agreement was reached. The working conditions on the site have become unbearable due to the foremen criticizing and finding fault with everything we have done recently. Poor management-labor relations have been building up. Therefore, we have gone on STRIKE to protest such poor working conditions.

ACTIVITY 58C AND D

Enclosing Exterior Walls

Today you will begin applying lap siding to the front wall. If you do not complete the activity today, you will be given additional time to finish.

Problem

Objective

Using the proper equipment and supplies, apply the exterior siding to the structure.

Equipment (Group of 5)

1 try square
1 framing square
2 claw hammers
1 brace with No. 8 (½″) auger bit
1 crosscut saw
1 compass saw *or*
1 sabre saw

Supplies (Group of 5)

6 pcs. ¼″ x 12″ x 48″ hardboard
1 pc. ¼″ x 2″ x 48″ starter strip
¼ lb. 6d galv. box nails

Preparing to Work

1. Get the needed equipment and supplies.

Applying Starter Strip

2. Place the 2″ hardboard strip against the front wall with its bottom edge ½″ above the floor surface. Let it rest on scraps of ½″ material. See Fig. 58CD-1.
3. Nail the strip in place with 6d galvanized box nails.

Applying Siding

4. Fit and apply the first course of siding, holding the bottom edge ½″ above the floor surface as in Step 2 and nailing 1″ above the bottom edge into each stud. See Fig. 58CD-2.
5. From the bottom edge of the first piece of siding, measure up 10″ and mark at each end. See Fig. 58CD-2.
6. Apply the second course of siding so that the bottom edge touches the marks just made. Nail into each stud 1″ above the bottom edge of the board as in Step 4.

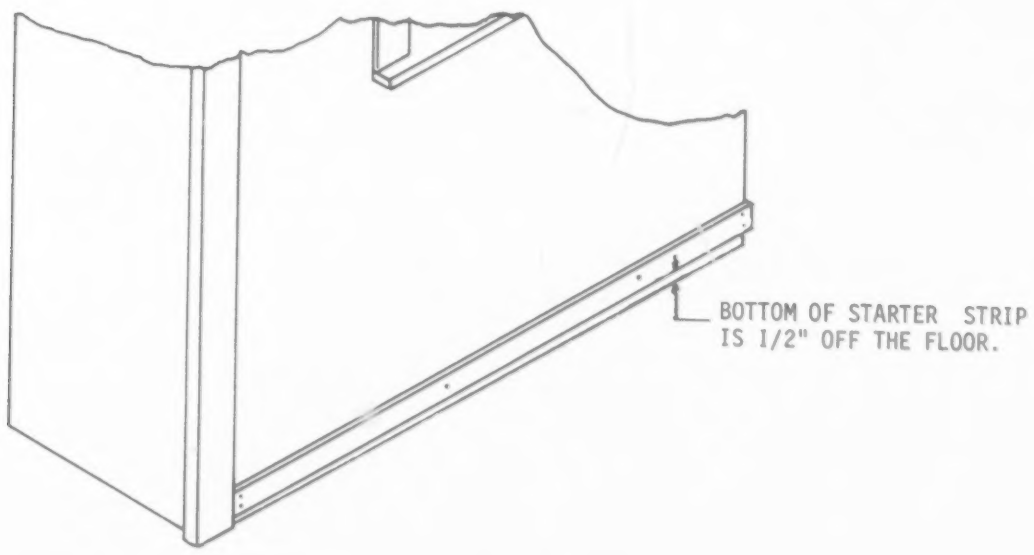

Fig. 58CD-1. Starter Strip Nailed in Place

7. Repeat Steps 5 and 6 for each succeeding course. Note: At the bottom and top of the window frame, the siding must be cut to fit. See Fig. 58CD-3. Mark and cut carefully, as there will be no trim of any kind covering the joints. Start corner holes with a brace and bit. Use a compass saw. Then finish with a crosscut saw.

Cleaning Up

8. Return all equipment, and clean the work area.

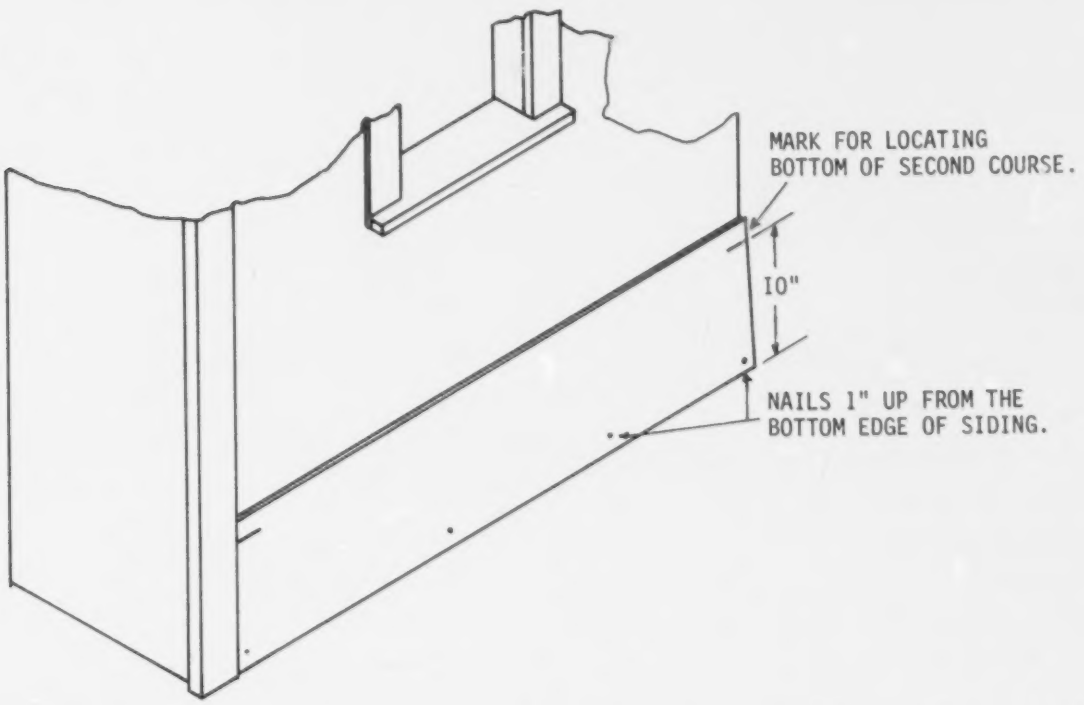

Fig. 58CD-2. First Course of 12" Lap Siding Nailed in Place: Position of Second Course Marked

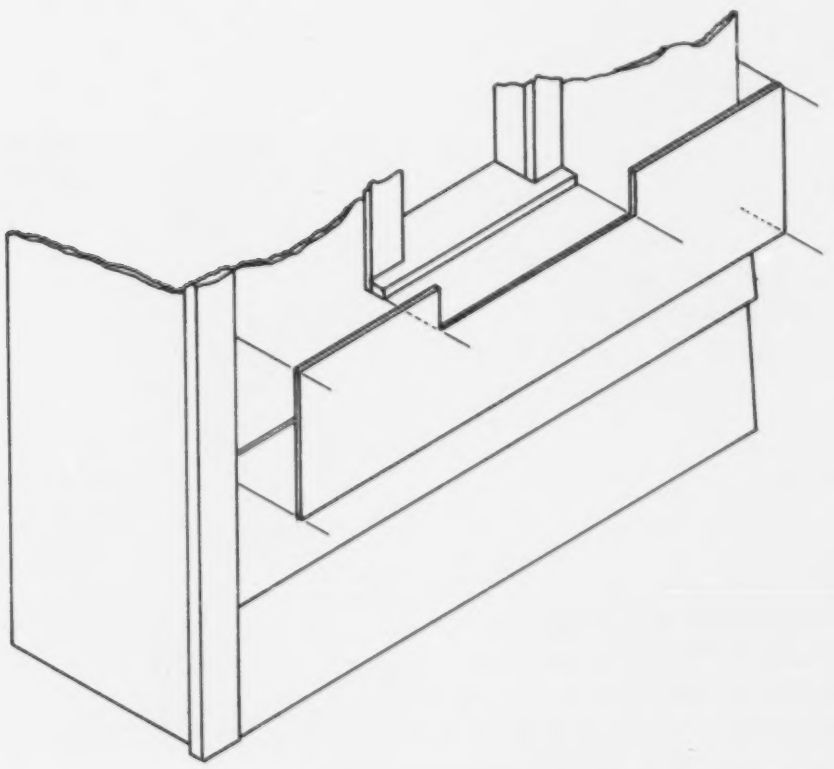

Fig. 58CD-3. Preparing Cutout for Window

ACTIVITY 58E

Enclosing Exterior Walls

Today you will lay part of a brick wall.

Problem

Objective

Using proper equipment and supplies, lay three courses of brick.

Equipment (Group of 5)

2 brick trowels
1 brick chisel *or* brick hammer
1 3/8" jointing tool
1 level
1 mud board
1 mason's line

Equipment (Per class)

1 mortar box *or* wheelbarrow
1 mixing hoe
1 shovel
1 bucket of water

Supplies (Group of 5)

25 common face bricks
1 pc. 26" x 72", No. 15 building felt *or* plastic sheeting

Supplies (Per class)

1 80 lb. bag mortar mix *or* ready mix mortar

Preparing to Work

1. Get the needed equipment and supplies.
2. Spread a 3' x 6' piece of building felt on the floor with a brick at each corner.
3. Mix mortar by gradually adding water to dry brick-masonry mix in a wheelbarrow or mortar box.

Laying Brick

4. Lay a dummy course of brick on the felt to simulate a foundation. See Fig. 58E-1.
5. Check the spacing of the foundation with five bricks, laid end-to-end. Then lay a

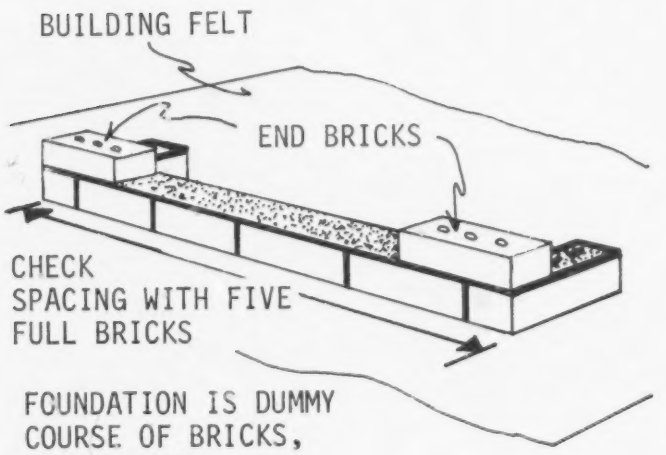

Fig. 58E-1. Foundation in Place and First Course Started

Fig. 58E-2. Mortar Ready for Buttering

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mortar bed, and butter the first course of bricks. See Fig. 58E-2.

6. Lay 3 courses of 5 bricks each, and check the level of each course. See Figs. 58E-3 and 58E-4. Note: One brick must be cut to permit staggering the joint. See Fig. 58E-5.

7. Dismantle the brick courses, and clean off the brick. Return the mortar to the wheelbarrow or as directed by the teacher. Wash your tools in a bucket of water, and store them for the next class.

Fig. 58E-3. Leveling First Course

Fig. 58E-4. Using Mason's Line

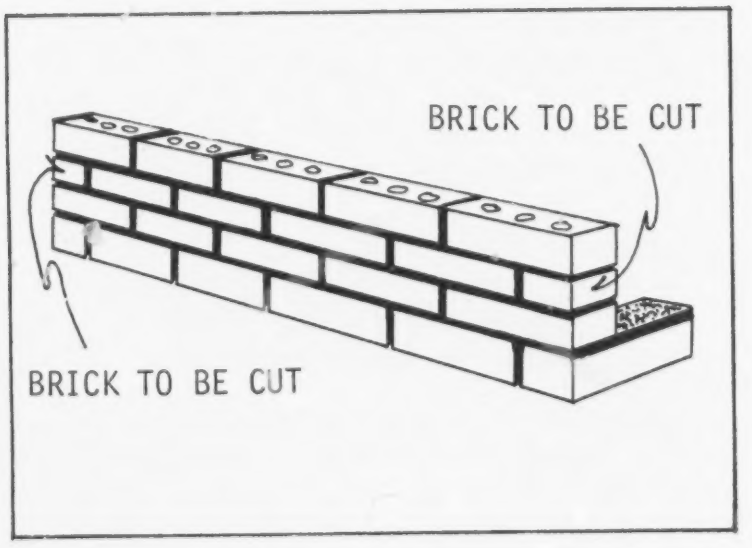


Fig. 58E-5. Three Courses Laid

ACTIVITY 60

Insulating

Today you will insulate part of your structure.

Problem

Objective

Using the proper equipment and supplies, install blanket insulation.

Equipment (Group of 5)

1 staple gun w/staples
1 steel tape
1 straightedge
1 utility knife
1 screwdriver

Supplies (Group of 5)

1 pc. 43″ length of blanket insulation, to be cut from 2″ x 14½″ roll
1 pc. scrapwood, for cutting board

Safety Precaution

Handle the insulation *only* when you must. It is hard to remove from clothes, and it sometimes irritates the skin.

Preparing to Work

1. Get the needed equipment and supplies. Your teacher will choose one student in your group to lay out and cut the insulating material (Steps 2 and 3).

Cutting to Length

2. Measure a 43″ length of blanket insulation. Lay the straightedge across the blanket at the 43″ mark, with a cutting board underneath the blanket. See Fig. 60-1.

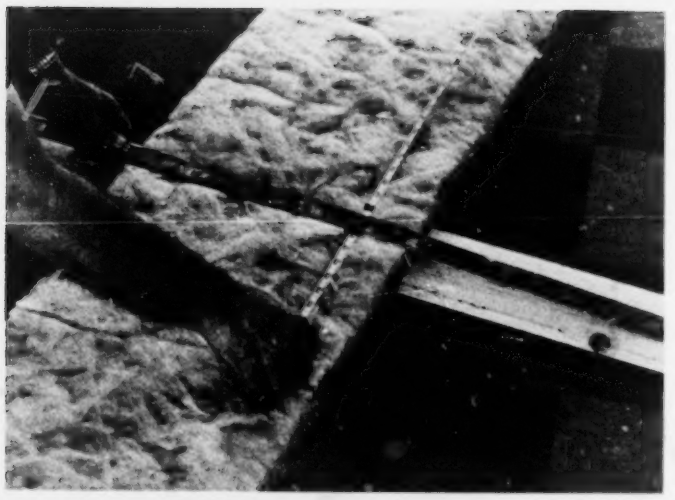


Fig. 60-1. Measuring 43″ Length of Blanket Insulation

Fig. 60-2. Cutting Blanket Insulation

Fig. 60-3. Making Tabs on the End of the Blanket

3. With the utility knife, cut the insulation to length. See Fig. 60-2.
4. If there is no stapling tab, push the insulating fiber back approximately 1½". (This may be done by one student, who should then wash his hands.) See Fig. 60-3.

Installing Insulation

5. Position the insulation between the first two studs. See Fig. 60-4. Allow for air space as shown in Fig. 60-5.
6. Staple the insulation in place.
7. Cut the insulating blanket to fit around the electrical outlet box. See Fig. 60-6.
8. Make a small cut for each water pipe and push the insulation over the pipe cap. See Fig. 60-7.

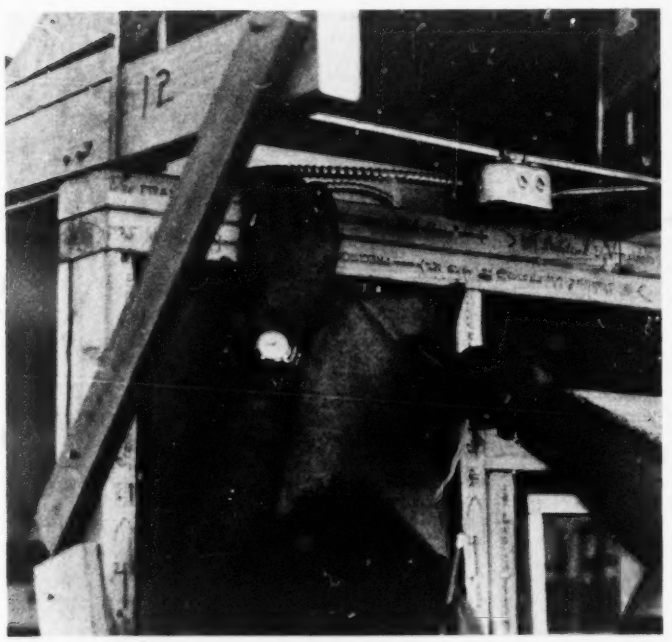


Fig. 60-4. Positioning and Stapling Blanket in Place

Fig. 60-6. Fitting Insulation Around Electrical Outlet

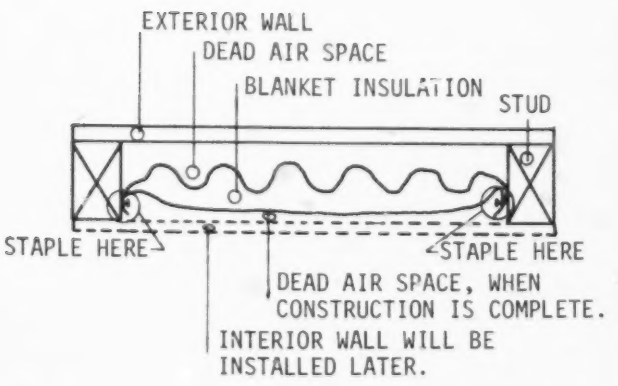


Fig. 60-5. Cross Section of Wall, Showing Properly Installed Blanket Insulation

Fig. 60-7. Fitting Insulation Around Water Pipes

9. Staple the insulation in place as shown in Fig. 60-8.

Precaution

Each student should wash his hands with soap and water following this activity.

Fig. 60-8. Blanket Insulation Installed in One Section of Wall

ACTIVITY 61A

Applying Wall Materials

Today you will apply a widely used wall material. It is called "gypsum board," "plasterboard," and sometimes "drywall material."

Problem

Objective

Using the proper equipment and supplies, lay out, cut, and install gypsum board on a structure.

Equipment (Group of 5)

1 claw hammer
1 4′ straightedge
1 utility knife
1 framing square
1 compass saw
1 screwdriver
1 steel tape

Supplies (Group of 5)

1 pc. 3/8″ x 45″ x 48″ gypsum board (drywall) : See Step 2.
1 box rock lath nails

Safety Precautions

1. Keep fingers away from cutting edges of utility knife.
2. To protect yourself and others from being cut, carry all sharp instruments carefully.

Preparing to Work

1. Get the equipment and supplies needed for covering the longer (front) wall of your structure. If the shorter (side) wall also is to be covered with gypsum board, your teacher will choose two students to perform that task. The rest of your group will work on the front wall.

Measuring and Cutting

2. Measure, square, and draw a line 45″ from one factory-cut end of a gypsum board sheet. See Fig. 61A-1.

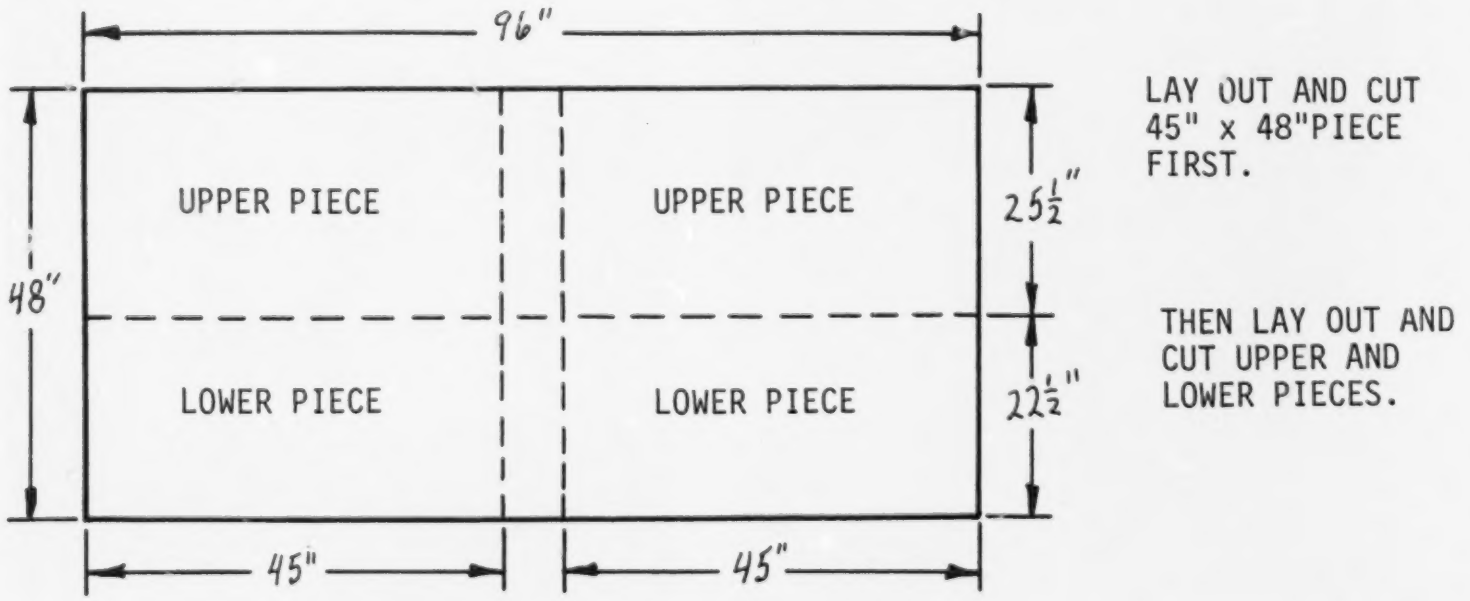


Fig. 61A-1. Layout Guide for Cutting Gypsum Board

3. Using a utility knife, score along the marked line. See Fig. 61A-2.
4. Stand the gypsum board on edge, and apply pressure to the back side of the scored line as shown in Fig. 61A-3.
5. Cut the paper backing with a utility knife, and separate the two pieces.
6. Lay out the 45″ x 48″ piece for cutting into two pieces, one measuring 45″ x 25½″ and the other 45″ x 22½″. See Fig. 61A-1.

Fig. 61A-2. Scoring with a Utility Knife

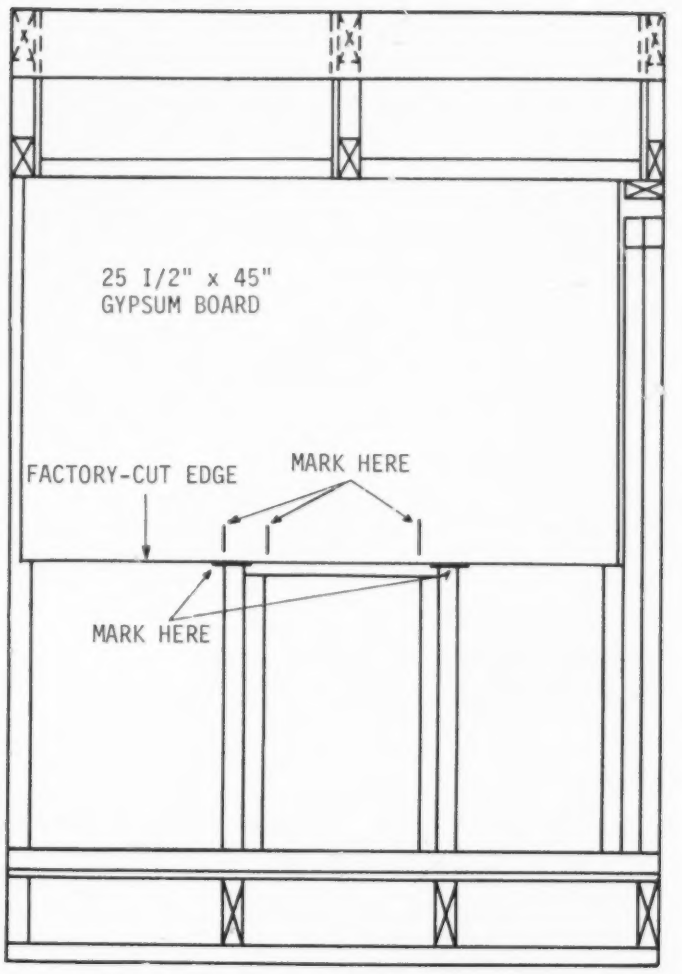


Fig. 61A-4. Interior View Showing 25½″ x 45″ Gypsum Board in Place, with Factory-Cut Edge at Bottom

Fig. 61A-3. Applying Pressure Along Scored Line

Fig. 61A-5. Measuring for Window

Installing Upper Piece

7. The 25½″ piece will be the *upper* piece. Hold it in place against the top inside of the wall section as shown in Fig. 61A-4. Mark as indicated on the gypsum board and on the studs.
8. Using the steel tape, measure down from the top of the window to the marks you have made on the studs. See Fig. 61A-5. Transfer this measurement to the upper piece.
9. Measure up from the mark on the stud, first to the bottom and then to the top of the duplex outlet box. Transfer these measurements to the gypsum board piece.
10. Lay out and cut a hole for the outlet box, following the techniques demonstrated by your teacher.
11. Place the gypsum board piece in position, and nail it to the studs with rock lath nails spaced about 12″ apart.

Installing Lower Piece

12. Measure across from the inside of the corner studs to the center of the galvanized cap on the cold-water pipe. See Fig. 61A-6.
13. Measure down from the bottom of the upper gypsum board piece to the center of the cold water cap. See Fig. 61A-7.
14. Transfer these two measurements to the 22½″ piece of gypsum board which will be the lower piece. See Figs. 61A-8 and 61A-9.

Fig. 61A-7. Measure Down for Pipe Location

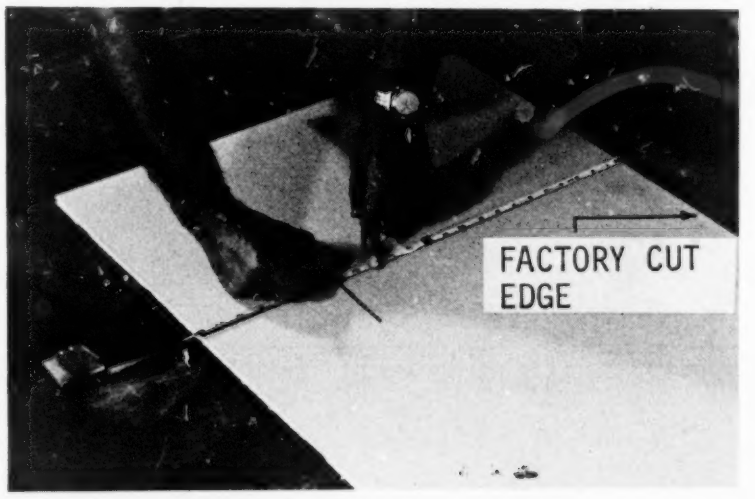


Fig. 61A-8. Transferring "Down" Measurement

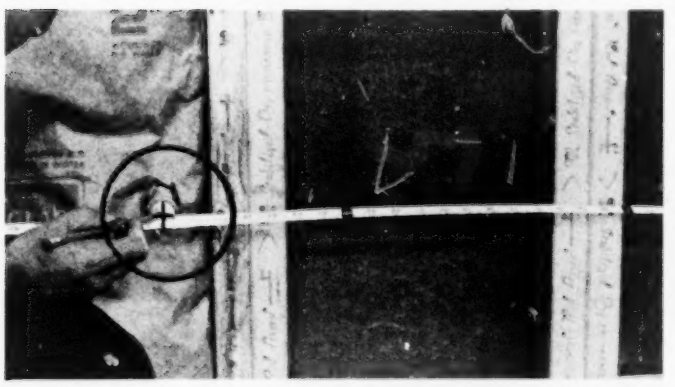


Fig. 61A-6. Measure Across for Pipe Location

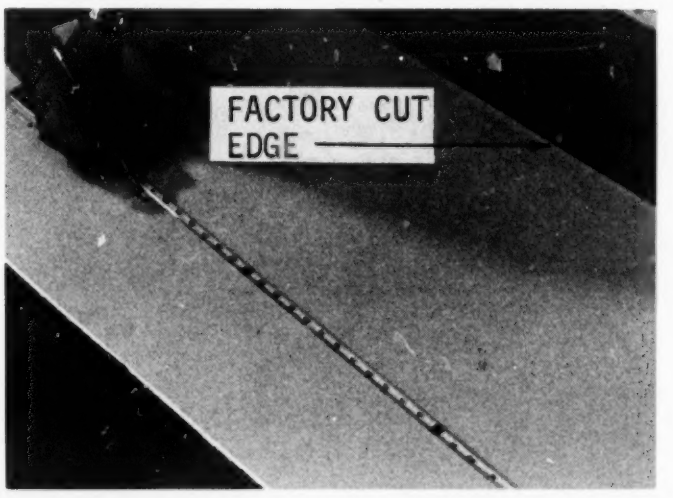


Fig. 61A-9. Transferring "Across" Measurement

15. Repeat Steps 12 through 14 to locate the hot water cap.
16. Use a screwdriver to poke a hole through the sheet on each center mark. See Fig. 61A-10.
17. With a compass saw, cut out a hole large enough to fit over each pipe cap. See Fig. 61A-11.
18. Nail the lower piece in place. "Dimple" the nail heads.

Cleaning Up

19. Return all equipment, and clean the work area.

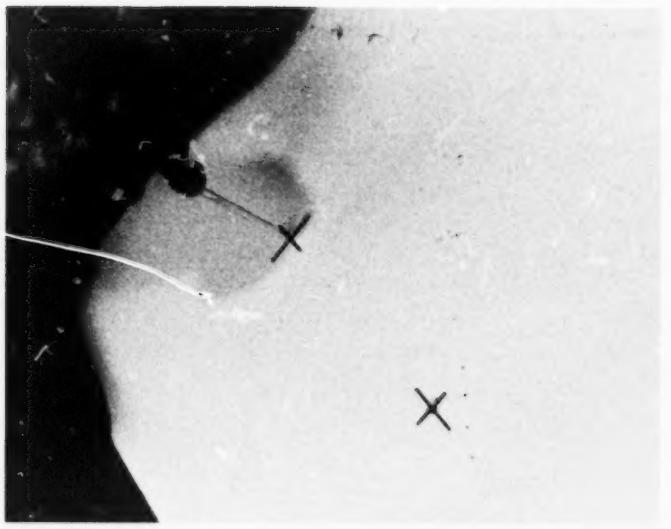


Fig. 61A-10. Poking Holes with Screwdriver

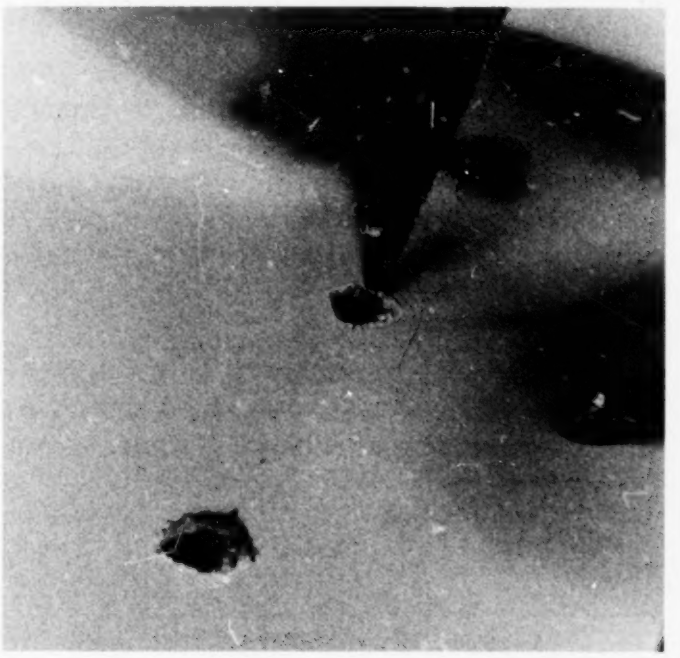


Fig. 61A-11. Sawing with Compass Saw

ACTIVITY 61B

Applying Wall Materials

Today you will tape and cement an interior wall surface.

Problem

Objective

Using proper equipment and supplies:

a. Mix and apply joint cement.
b. Apply joint tape.

Equipment (Group of 5)

1 tape knife
1 finishing trowel
1 claw hammer
1 mud board for joint cement

Equipment (Per class)

1 bucket
1 measuring cup

Supplies (Per class)

1 pkg. joint treatment cement
1 roll joint tape
water
rags

Preparing to Work

1. Have one or two students mix the joint treatment cement for the entire class, following Steps 2 through 4.
2. Check the instructions on the package of joint treatment cement for proper proportions of water and cement.
3. Place the proper amount of water in the bucket. Then slowly add the proper amount of joint treatment cement to the water and stir constantly. See Fig. 61 B-1.
4. Mix the water and cement with a tape knife to a pastelike consistency. See Fig. 61B-2.
5. Each group should obtain a small quantity of cement on a mud board along with the needed equipment and supplies.

Fig. 61B-1. Adding Cement

Fig. 61B-2. Mixing

Applying Cement

6. Drive in any nail heads along the joint so that a dimple is made by the hammer head.
7. Spread cement over all nails and indentations in the gypsum board. See Fig. 61B-3. Pound down any nails which cannot be covered.
8. Spread cement over joints between the sheets of plasterboard. See Fig. 61B-4.

Taping

9. Dampen the tape so it will not absorb moisture from the cement and cause cracking.
10. Apply tape over the cemented joints. See Fig. 61B-5.

Troweling

11. Using a trowel, smooth out the joint tape and cement over it. See Fig. 61B-6.
12. Add more cement over the tape. Spread it evenly, using the trowel.

Cleaning Up

13. Discard any leftover wet cement, and wash your equipment.

Caution

Do not pour cement down any plumbing drain.

14. Return all equipment, and clean the work area.

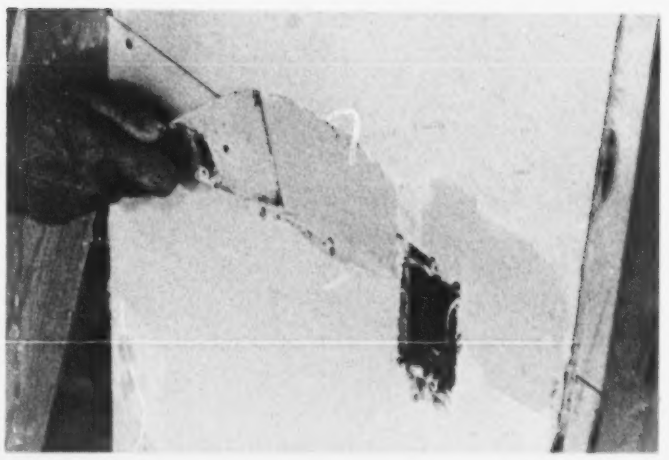


Fig. 61B-4. Covering Joints

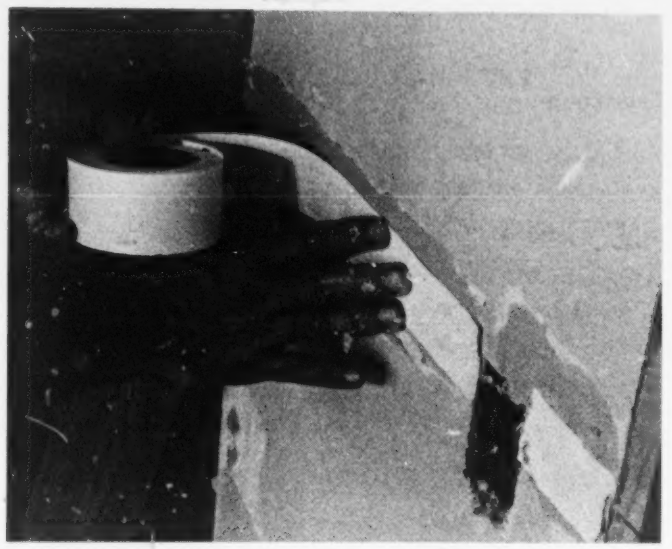


Fig. 61B-5. Taping

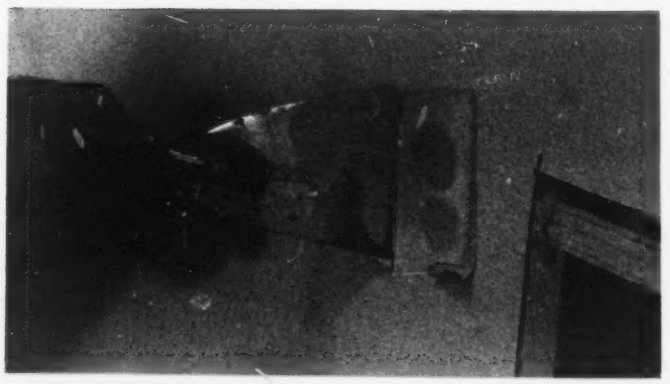


Fig. 61B-3. Spreading

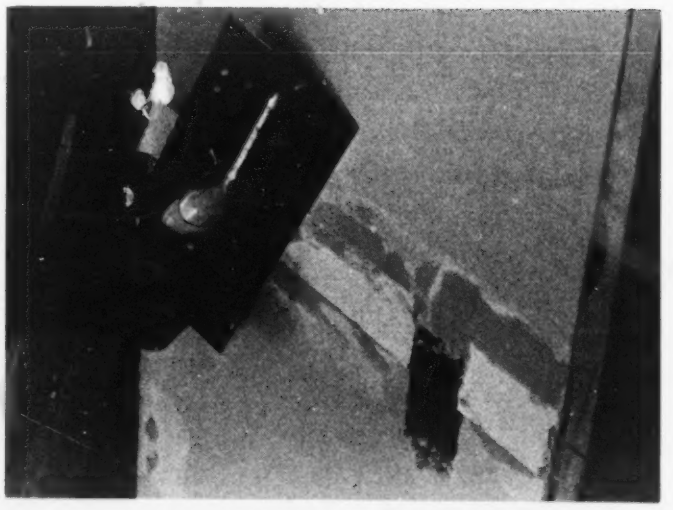


Fig. 61B-6. Smoothing

ACTIVITY 61C

Applying Wall Materials

Problem 1

Objective

Using proper equipment and supplies, sand and apply a second coat of joint cement.

Equipment (Subgroup: 3 students)
1 tape knife
1 finishing trowel
1 mud board for joint cement

Equipment (Per class)
1 bucket
1 measuring cup

Supplies (Subgroup: 3 students)
¼ sht. 1/0 abrasive paper

Supplies (Per class)
1 pkg. joint treatment cement

Preparing to Work

1. Have one or two students mix the joint cement for the class. Follow the directions on the package carefully.
2. Each group should obtain a small amount of prepared cement along with the needed equipment and supplies.

Sanding and Applying Joint Cement

3. Lightly sand all rough spots on the gypsum board surface.
4. Apply a thin layer of joint cement over the nailed and recessed areas, as in Activity 61B.

Cleaning Up

5. Discard any leftover cement, and wash your equipment.

Caution

Do *not* pour cement down a sink drain.

6. Return all equipment, and clean the work area.

Problem 2

Objective

Using proper equipment and supplies, install wall paneling on the short wall.

Equipment (Subgroup: 2 students)
1 compass w/pencil
1 claw hammer
1 try square
1 block plane
1 ratchet brace with No. 8 (½") auger bit *or*
1 electric drill with ½" speed bit
1 nail set
1 compass saw *or* sabre saw

Supplies (Subgroup: 2 students)
1 pc. 11" x 48" paneling
10 4d finish nails
1 pc. chalk

Preparing to Work

1. Get the necessary equipment and supplies.

Fitting to Corner

2. Hold the paneling in place against the short wall as shown by your teacher.
3. If the paneling needs to be fitted to the corner, find the widest gap between the paneling edge and the front wall. Adjust the compass to span that gap.
4. Let the surface of the front wall guide the compass point, and scribe a line on the paneling. See Fig. 61C-1.

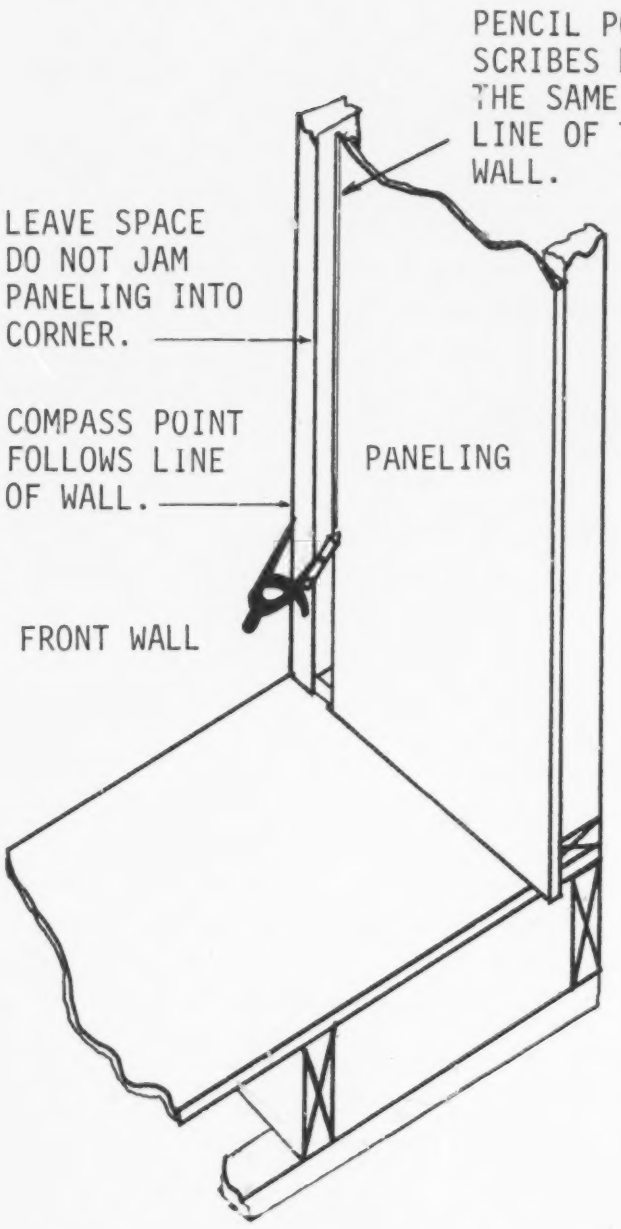

PENCIL POINT SCRIBES LINE THE SAME AS LINE OF THE WALL.
LEAVE SPACE DO NOT JAM PANELING INTO CORNER.
COMPASS POINT FOLLOWS LINE OF WALL.
PANELING
FRONT WALL

Fig. 61C-1. Scribing to Obtain Good Fit

5. Plane the paneling edge to the scribed line. See Fig. 61C-2.

Cutting Hole for Switch Box

6. Locate and cut out an opening for the switch outlet box as shown by your teacher.

Caution

Drill and saw carefully to avoid splitting the finish side of the paneling.

Installing Paneling

7. Install the paneling with 4d finishing nails. Set all nails.

Cleaning Up

8. Return all equipment, and clean the work area.

Fig. 61C-2. Using a Block Plane, Follow Scribed Lines Along Edge of Panel

ACTIVITY 61D

Applying Wall Materials

Today you will apply a brown coat of plaster to a rock lath surface using the tools and techniques of a plasterer.

Problem

Objective

Using the proper equipment and supplies, plaster a section of a simulated wall frame.

Equipment (Group of 5)

2 finishing trowels
1 hawk, for plaster
1 simulated wall frame with rock lath applied

Equipment (Per class)

1 broom
1 wheelbarrow
1 hoe
1 bucket, for water to mix with plaster
1 barrel, for water to clean equipment

Supplies (Group of 5)

1 24″ straightedge (scrap wood)

Supplies (Per class)

2½ gal. water, for mixing
40 lb. mill-mix gypsum plaster
quantity of sand (as recommended on gypsum plaster bag)
water, for cleaning

Caution

Avoid spilling plaster on your skin or clothing.

Preparing to Plaster

1. One group of students will mix the plaster for the class (Steps 2 through 5).
2. Put 40 pounds of plaster into a wheelbarrow. Add the proper amount of sand, following directions on the plaster package.
3. Pour some of the water into the wheelbarrow along one side or at the back. Do *not* pour it on top of the plaster. See Fig. 61D-1.
4. Using the hoe, mix water and plaster a little at a time to a heavy, creamy paste. Add water as needed, but don't add too much. See Fig. 61D-2.

Fig. 61D-1. Water Is Poured Beside Plaster, Not on Top

Fig. 61D-2. Mixing Plaster

5. Put the wheelbarrow in the work area so each group can easily get its supply of plaster.
6. Get the needed equipment and supplies. Place plaster on the hawk with the hoe. See Fig. 61D-3.

Applying Ground Coat

7. Using the trowel, "cut off" and load the trowel. Apply plaster on the rock lath. Spread it flush with the top and bottom ground. See Fig. 61D-3.
8. Using a straightedge, scrape excess plaster off the wall section. Add plaster where necessary. See Fig. 61D-4.
9. Touch up any bad spots with the trowel.
10. Using a regular broom, brush very lightly over the plaster to give a textured finish. (This is done so the next coat of plaster will adhere or "stick" to the surface.)

Cleaning Up

11. Scrape the coat of plaster off the rock lath, and return it to the wheelbarrow.

Caution

Wash all equipment in a barrel of water. Do not pour plaster down any plumbing drain.

12. Return all equipment and supplies, and clean the work area thoroughly.

Fig. 61D-3. Spreading Plaster

Fig. 61D-4. Using Straight Edge to Level Surface

ACTIVITY 62

Applying Ceiling Materials

Today you will install ceiling materials.

Problem

Objective

Using the proper equipment and supplies, install furring strips and ceiling tile.

Equipment (Group of 5)

1 claw hammer
1 steel tape
1 framing square
1 crosscut saw
1 compass saw
1 utility knife
1 staple gun/staples
1 screwdriver

Supplies (Group of 5)

2 1″ x 2″ x 45″ furring strips
6 6d box nails
4 12″ x 12″ acoustical ceiling tiles *or*
2 12″ x 24″ tiles

Safety Precaution

Use a staple gun only for fastening one piece of material to another. Do not operate it in any other way.

Preparing to Work

1. Get the needed equipment and supplies.

Installing Furring Strips

2. Measure across the ceiling and cut the furring strips to the proper length if necessary. See Fig. 62-1.

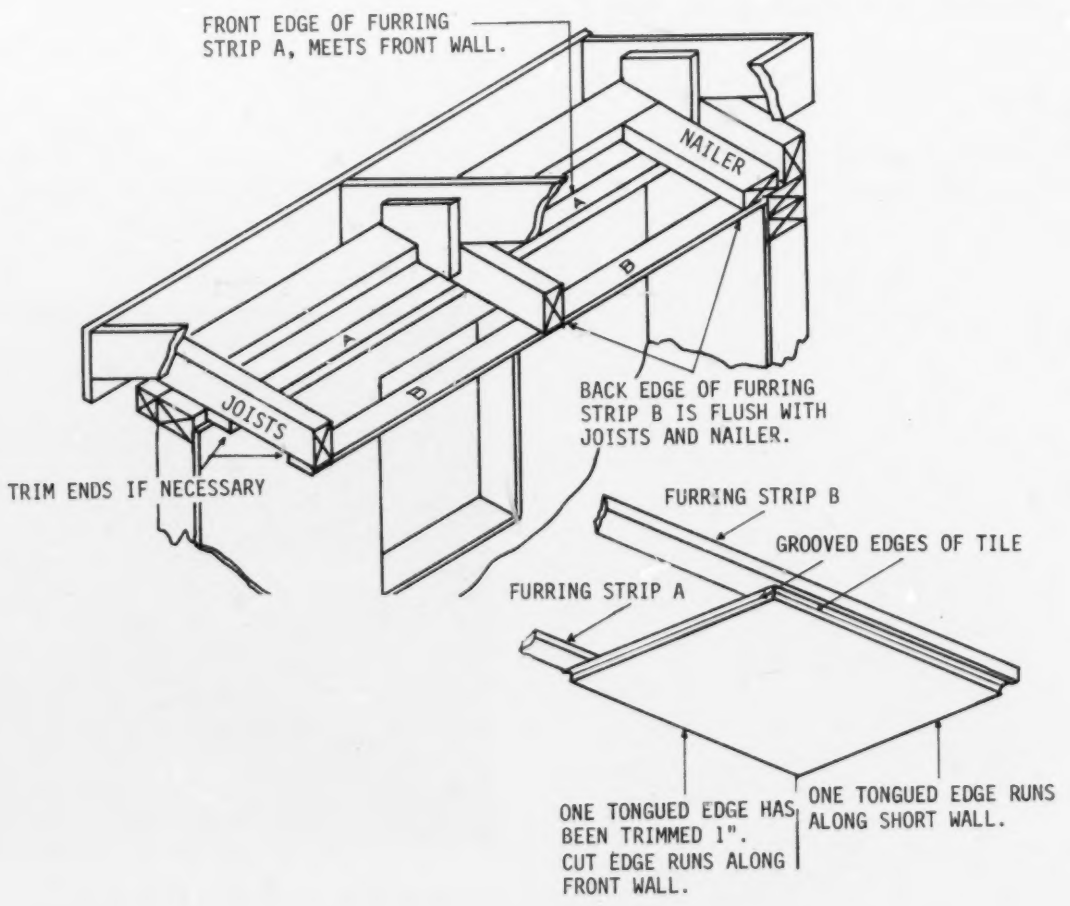

FRONT EDGE OF FURRING STRIP A, MEETS FRONT WALL.
NAILER
A
B
JOISTS
TRIM ENDS IF NECESSARY
BACK EDGE OF FURRING STRIP B IS FLUSH WITH JOISTS AND NAILER.
FURRING STRIP B
GROOVED EDGES OF TILE
FURRING STRIP A
ONE TONGUED EDGE HAS BEEN TRIMMED 1". CUT EDGE RUNS ALONG FRONT WALL.
ONE TONGUED EDGE RUNS ALONG SHORT WALL.

Fig. 62-1. Furring Strips in Position for Nailing

3. Nail Furring Strip A with one edge against the front wall. Nail Furring Strip B flush with the ends of the joists and nailer. See Figs. 62-1 and 62-2.

Installing Corner Tile

4. Hold a tile against the furring strips as in Fig. 62-3. Check the position of the two tongued edges.
5. Mark the tongued edge that lies along the *front* wall.
6. Lay out and cut 1" from this edge.
7. Staple the tile in place along the grooved edges. See Fig. 62-4.

Installing Remaining Tiles

8. Repeat Steps 4 through 7 for the next tile.
9. When the ceiling outlet is reached, carefully lay out the location of the outlet on a tile. With a screwdriver, pierce the tile inside the marked area. Then make the necessary cutout, using a compass saw.
10. Install enough tiles to cover the ceiling. (The number will depend on the tile size.)

Cleaning Up

11. Return all equipment and supplies, and clean the work area.

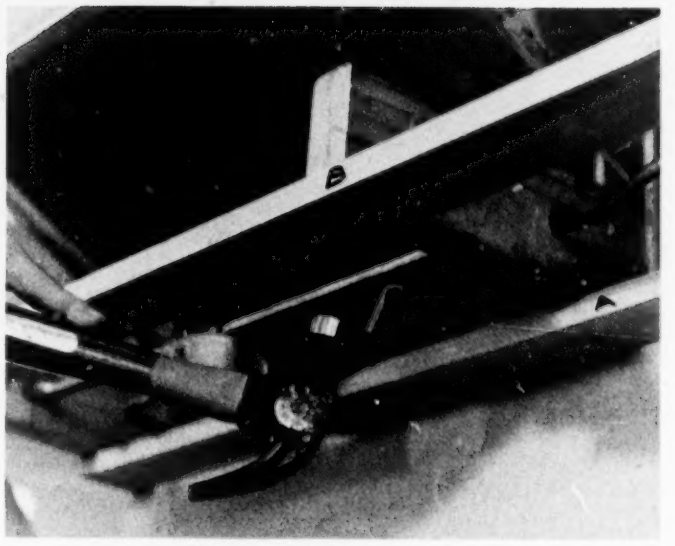


Fig. 62-2. Nailing Furring Strips to Joists

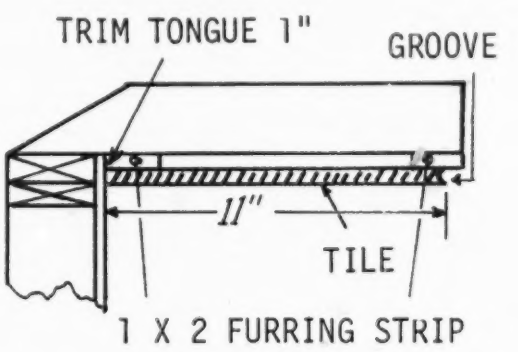


Fig. 62-3. Corner Tile in Position for Stapling (View is from the Open Side.)

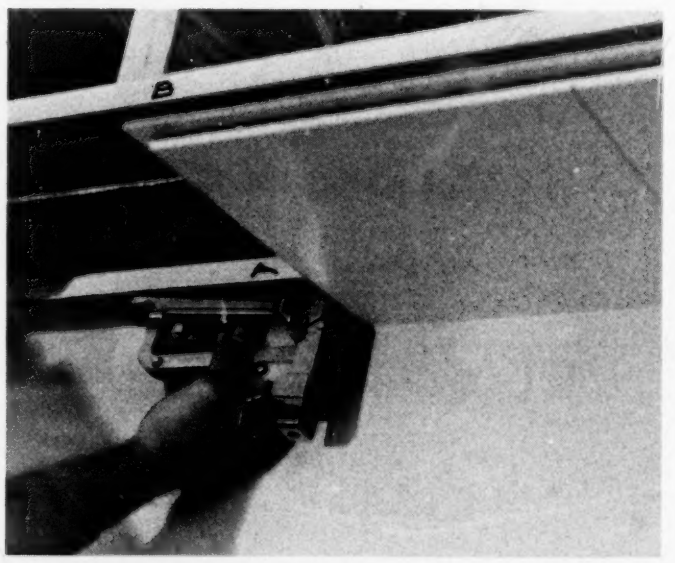


Fig. 62-4. Tile in Position for Stapling

ACTIVITY 63

Laying Floors

Today you will install flooring material.

Problem

Objective

Using the proper equipment and supplies, lay a vinyl tile floor.

Equipment (Group of 5)

1 dust brush
1 straightedge
1 mastic applicator
1 snips *or* utility knife

Supplies (Group of 5)

4 12″ x 12″ vinyl tiles
¼ pt. tile mastic, water soluble

Caution

Do not get tile mastic on your clothing.

Preparing to Work

1. Get the needed equipment and supplies.
2. Clean off the floor area with the brush. The floor surface must be free from sawdust and dirt.

Fitting Tile

3. Lay the four pieces of tile on the floor area to see how they fit.
4. If the tiles extend beyond the floor edge, mark them as shown in Fig. 63-1. Cut the tiles on the marked line with the snips or a utility knife.
5. Measure from the front wall to obtain the ductwork opening measurements. Transfer the measurements to the tile and cut. See Fig. 63-2.
6. Lay the cut tiles back in position on the floor area, and check for a good fit.

Installing Tile

7. If the fit is satisfactory, remove the tiles and spread an even coat of tile mastic on the floor.
   a. Use no more mastic than is absolutely necessary.
   b. Be sure to keep the mastic on the floor area.

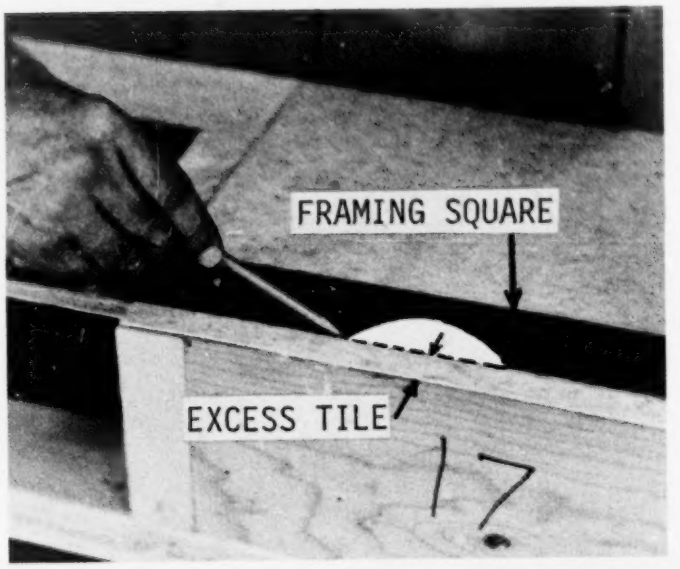


Fig. 63-1. Marking Tile to Fit Floor

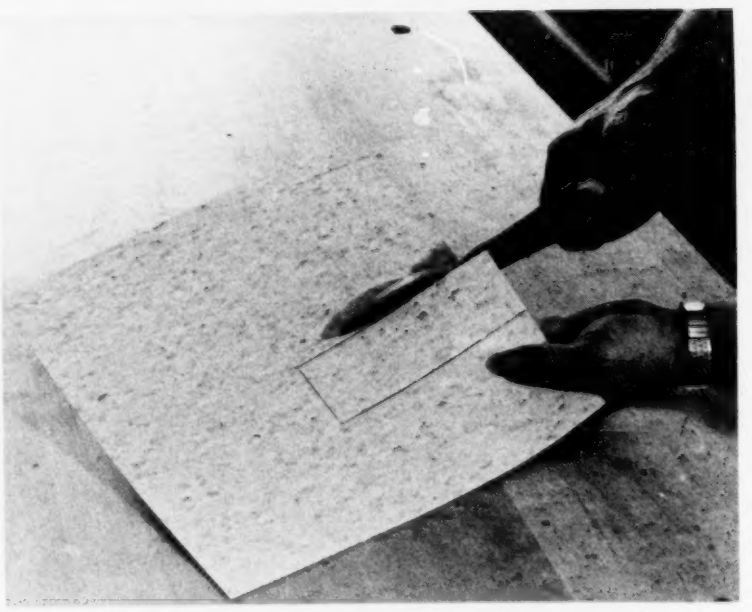


Fig. 63-2. Cutting Opening for Ductwork

c. Spread the mastic evenly. See Figs. 63-3 and 63-4.

8. Allow the mastic to dry so that it will not feel sticky or "tacky" to the touch.
9. Place the tiles in position and check the fit. See Fig. 63-5.
10. Press the tiles firmly down against the floor.

Cleaning Up

11. Clean the mastic applicator, return all equipment and supplies, and clean the work area.

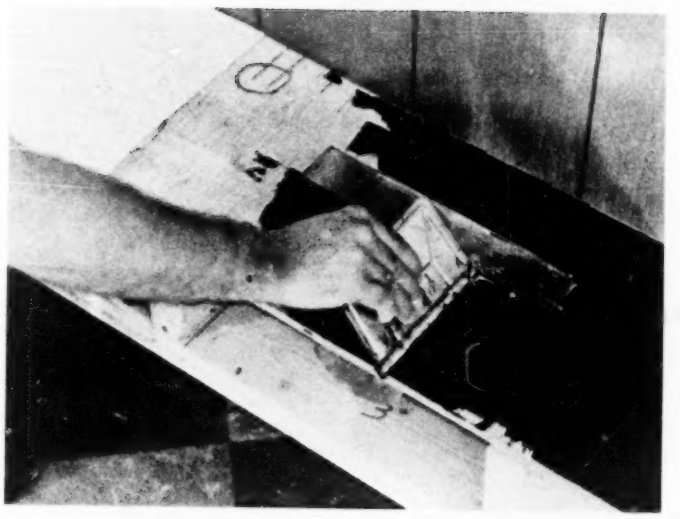


Fig. 63-4. Spreading Mastic

Fig. 63-3. Applying Mastic

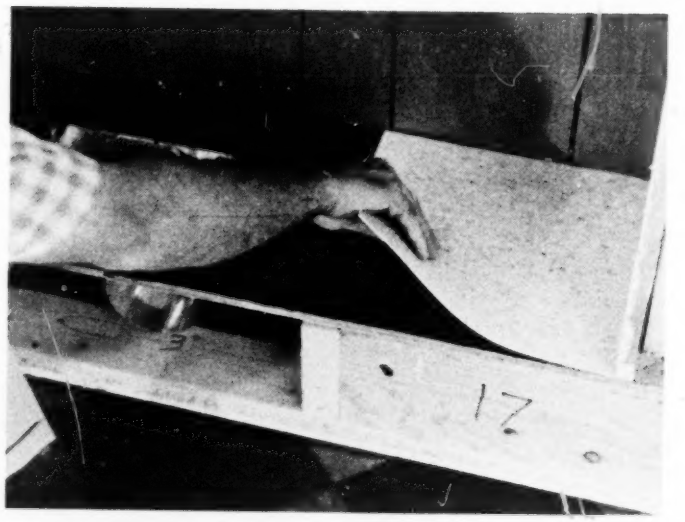


Fig. 63-5. Placing Tile

ACTIVITY 64A

Finishing the Project

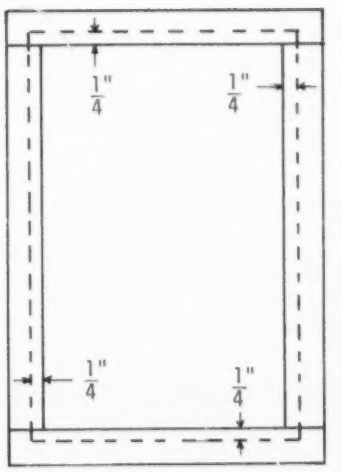


Fig. 64A-1. Interior View of Window Frame, Showing Layout Lines ¼" from Inner Edges

Problem

Objective

Using proper equipment and supplies, measure, cut, and install the inside window casing.

Equipment (Group of 5)

1 miter box with saw
1 steel tape
1 1/32" nail set
1 claw hammer
1 straightedge

Supplies (Group of 5)

1 pc. 2¼" x 8' teardrop casing, convex face
12 4d finish nails
12 8d finish nails

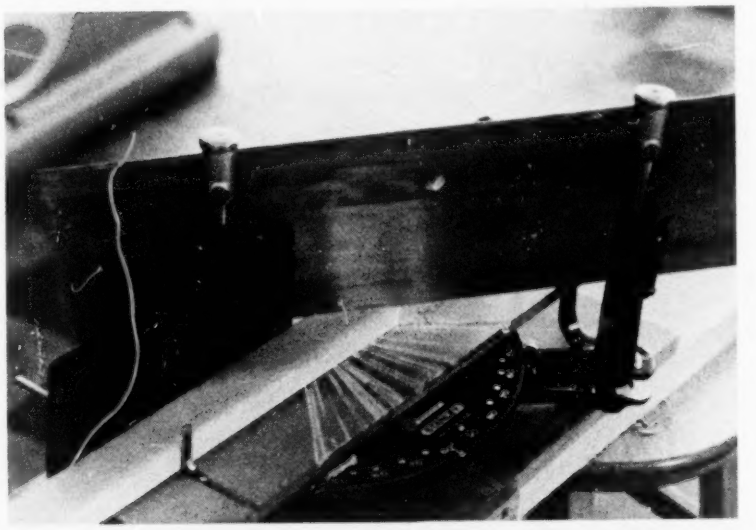


Fig. 64A-2. Cutting Casing with Miter Saw

Preparing to Work

1. Get the needed equipment and supplies.

Measuring and Cutting

2. Measure and mark ¼" away from the inside edge of the window opening on the top, bottom and sides. See Fig. 64A-1. Using a straightedge, draw pencil lines on all four sides. (When you apply the molding, this ¼" will be left exposed.)
3. Lay out a 45° miter on one end of the teardrop casing so that the thicker edge forms the point. Place the thicker edge of the casing toward the operator and cut with the miter saw. See Fig. 64A-2.
4. Measure distance "A" as shown on Fig. 64A-3.

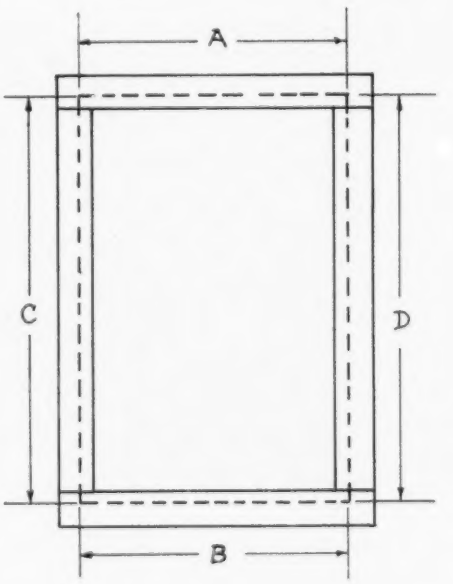


Fig. 64A-3. Location for Measurements

5. Mark on the *thin edge* of the casing a length equal to "A".
6. Cut a 45° miter with the miter saw to the measured length "A". See Fig. 64A-4.
7. Install the top window trim on the ¼" pencil line, using the 4d finish nails about ⅜" away from the thin edge and 8d finish nails ⅜" away from the thick edge.
8. Using the technique for cutting A, lay out and cut the miters on B, C, and D.

Installing Window Casing

9. Install the left side window trim (C) on the ¼" pencil line to make a 90° angle with the top trim. Use 4d finish nails about ⅜" away from the thin edge and three 8d finish nails ⅜" from the thick edge. See Fig. 64A-5.
10. Install the right side window casing on the ¼" pencil line on the right side of the window.
11. Install the bottom window casing on the ¼" pencil line on the bottom of the window. It may be necessary to trim the last piece to fit in place. See Fig. 64A-6.
12. Set all nails.

Cleaning Up

13. Return all equipment, and clean the work area.

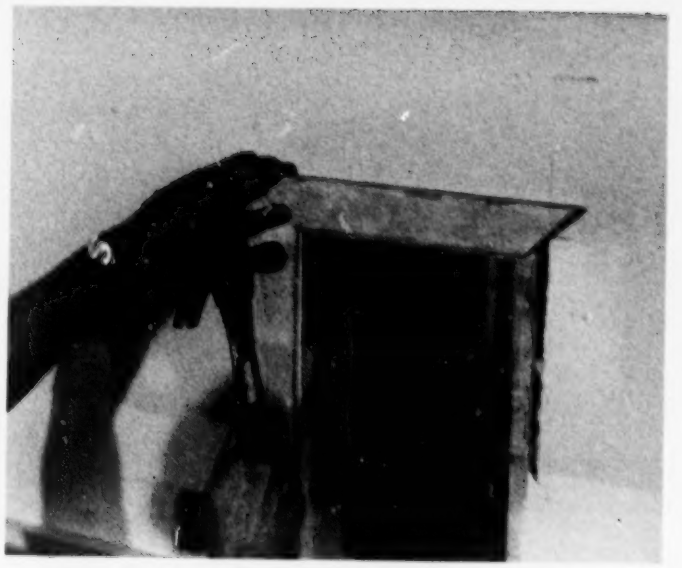


Fig. 64A-5. Nailing Casing in Place

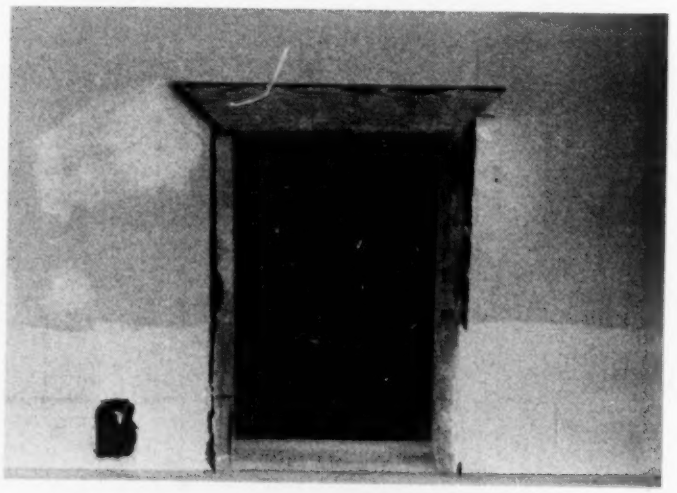


Fig. 64A-4. Top Casing Mitered to Fit

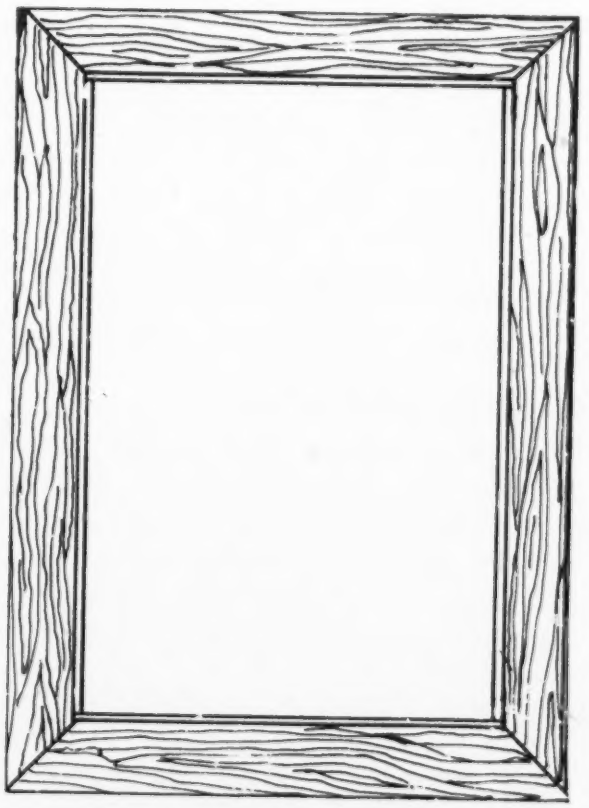


Fig. 64A-6. Completed Window Casing

ACTIVITY 64B

Finishing the Project

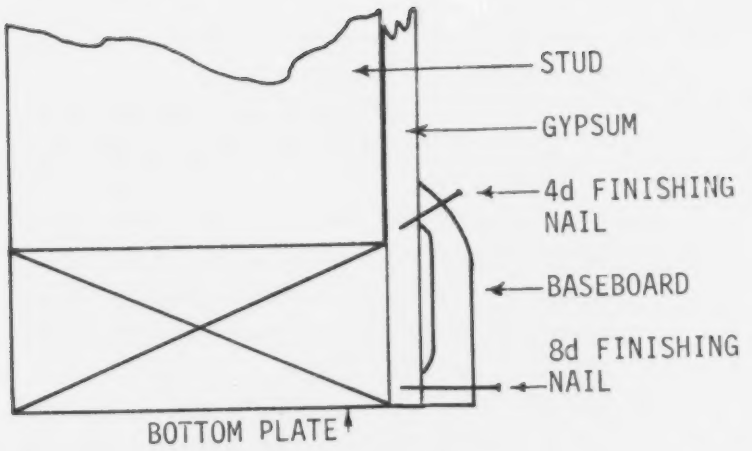


Fig. 64B-1. Nailing Baseboard in Place

Today you will install finish trim.

Problem

Objective

Using the proper equipment and supplies, install baseboard, base shoe, and cove molding on the interior of your structure.

Equipment (Group of 5)

1 miter box with saw
1 coping saw
1 wood file
1 steel tape
1 nail set
1 claw hammer

Supplies (Group of 5)

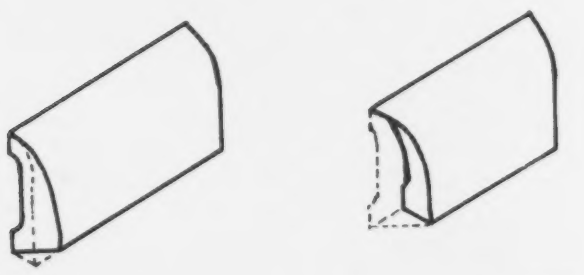
1 pc. ½" x 2¼" x 6' baseboard
1 pc. ½" x ¾" x 6' base shoe
1 pc. ¾" x 6' cove molding
qty. 4d finish nails
qty. 8d finish nails
¼ sht. abrasive paper (medium)

Preparing to Work

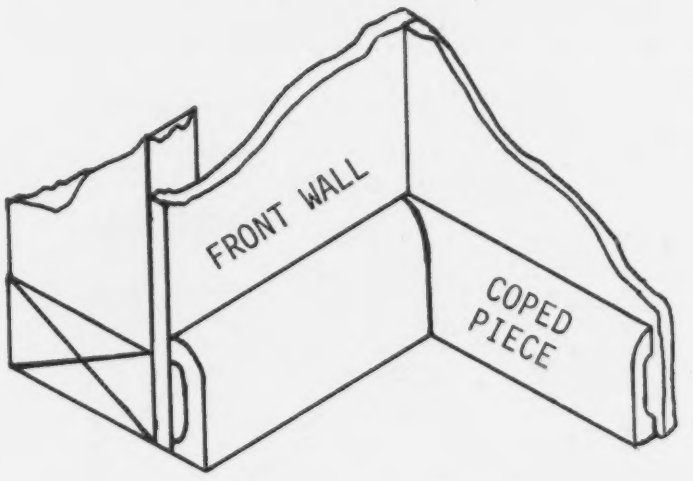
1. Get the needed equipment and supplies.

Installing Baseboard

2. Measure the bottom edge of the long wall and lay out this distance on the baseboard. Using a miter saw, cut the baseboard square at the mark.
3. Place this piece in the structure and secure it with 4d and 8d finish nails in each stud as shown in Fig. 64B-1.
4. Make a coped left end on the remaining piece of baseboard so it will fit, at the



MAKING COPED END: TWO-STEP TECHNIQUE



COPED PIECE FIT IN PLACE

Fig. 64B-2. Cutting and Fitting a Coped Joint

corner, with the piece already installed:
   a. Make a 45° miter cut.
   b. Use a coping saw to cut out along the edge of the miter. See Figs. 64B-2 and 64B-3.
5. Trim the coped cut with a wood file if necessary. Then wrap a piece of abrasive paper around a scrap piece of baseboard, and sand the coped edge to fit. See Fig. 64B-4.
6. Fit the piece in position, and mark the other end to the proper length. Make a square cut, and install the piece as in Step 3.

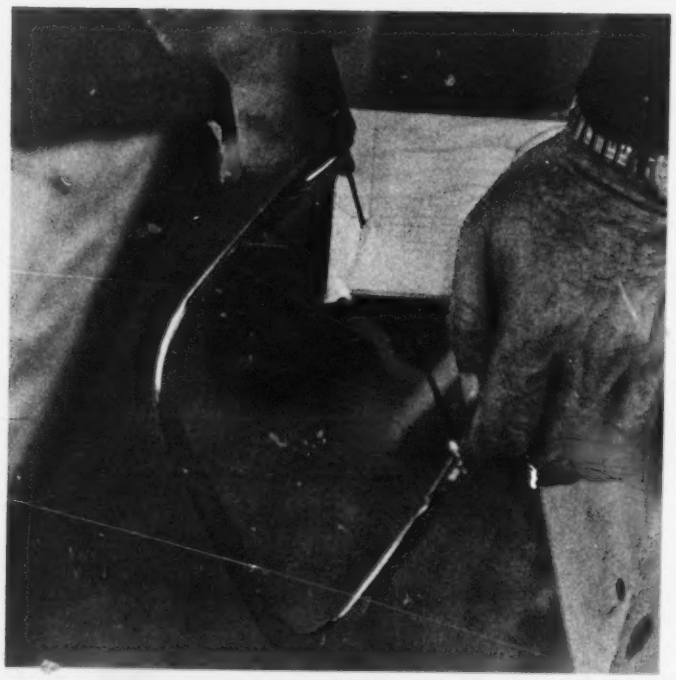


Fig. 64B-3. Using Coping Saw to Form Coped End

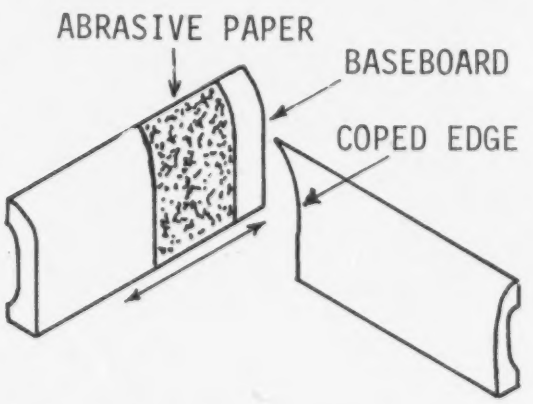


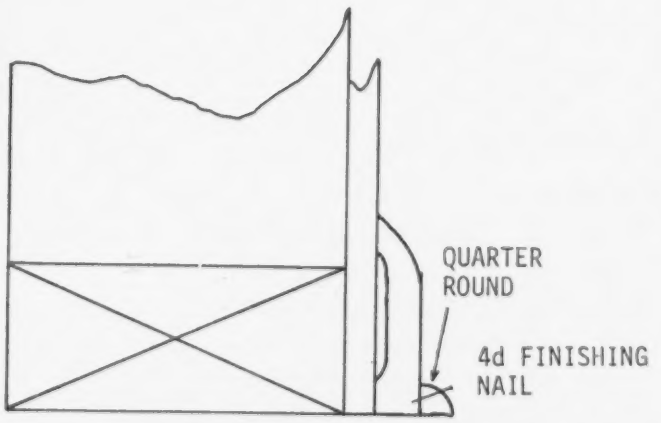
Fig. 64B-4. Abrasive Paper Wrapped Around Scrap Molding

Installing Base Shoe

7. Measure the front baseboard along the floor. Lay out this distance on the base shoe, and make a square cut.
8. Nail this piece in place as shown in Fig. 64B-5.
9. Make a coped end on the remaining piece of base shoe as in Step 4.
10. Trim up the coped cut with abrasive paper as in Step 5.
11. Fit the piece, and mark the other end to the proper length. Make a square cut and install.

Installing Cove Molding

12. Measure the top of the long wall. Lay out this distance on the cove molding, and make a square cut.
13. Place this piece at the top of the wall, and secure it with 4d finish nails.



NAILING BASE SHOE IN PLACE

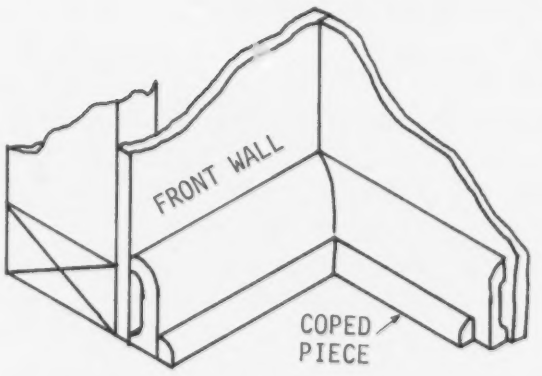


Fig. 64B-5. Fitting Base Shoe in Place

14. Make a coped end on the remaining piece of cove molding. See Fig. 64B-6.
15. Trim up the coped cut with abrasive paper.
16. Mark the other end to the proper length. Make a square cut and install.
17. Set all nails as in Fig. 64B-7.

Cleaning Up

18. Return all equipment, and clean the work area.

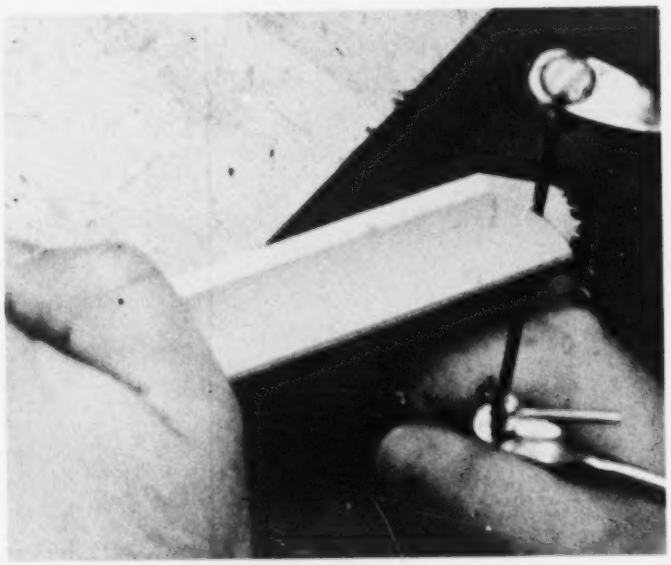


Fig. 64B-6. Sawing Coped End on Cove Molding

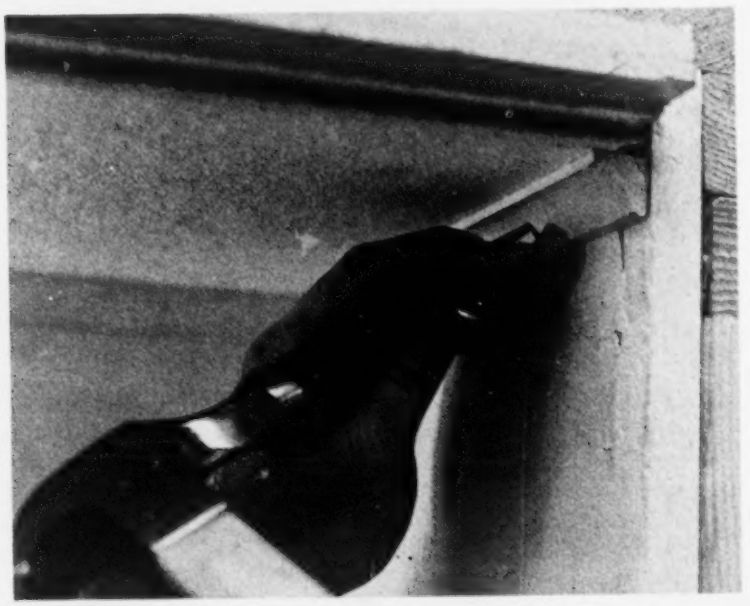


Fig. 64B-7. Setting Nails

ACTIVITY 65A

Painting and Decorating

Today you will prepare your structures for painting.

Problem

Objective

Using the needed equipment and supplies, prepare the interior and exterior surfaces of your structure for painting.

Equipment (Group of 5)

1 caulking gun with compound
1 nail set
1 claw hammer
1 tape knife
1 1½" paint brush (optional)
1 stepladder

Supplies (Per class)

1 can putty
1 qt. clear shellac
1 qt. turpentine
5 shts. abrasive paper (fine)
several clean rags
1 qt. methyl alcohol (if brush is used for applying shellac)
5 8 oz. paper cups *or* cans

Preparing to Work

1. Your group is to divide into two crews. One crew will work on the interior; the other crew will work on the exterior.
2. Get the needed equipment and supplies. Share tools as necessary.

Filling Cracks and Holes

3. Check all nails. Set any that are not sunk below the surface.
4. Fill all nail holes and cracks with putty. Use the putty knife to smooth the surface for painting. Danger spots to examine for cracks are sills, edges of eaves, and joints in the window frame. See Fig. 65A-1.
5. Sand all noticeable rough areas.

Caulking

6. With a caulking gun and cartridge, caulk around the exterior window frame. The purpose of caulking is to get the compound *into* the crack. Do not let it pile up or spread onto the siding.

Fig. 65A-1. Applying Putty

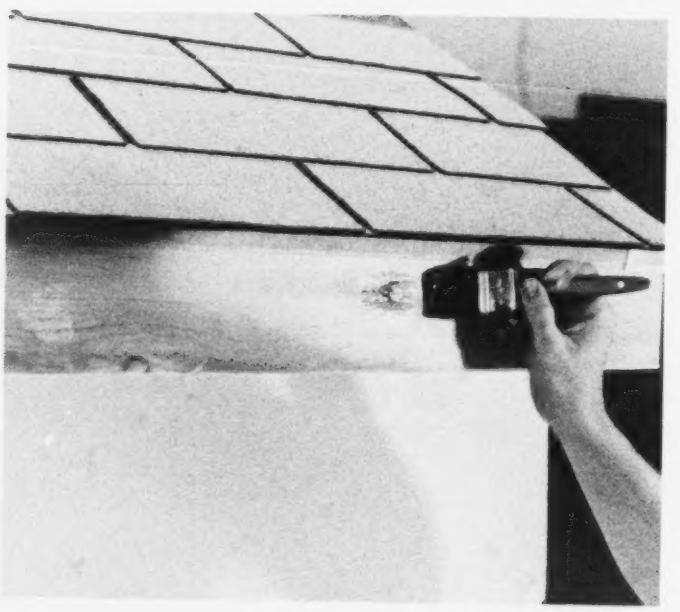


Fig. 65A-2. Sealing Knots

Priming Knots

7. Look for knots in the exterior siding and interior trim. Seal all visible knots with a primer coat of clear shellac. Either wipe on the shellac with a clean rag, or brush it on as in Fig. 65A-2.

Cleaning Up

8. If you use a brush, clean it promptly with alcohol.
9. Dust all surfaces. Wipe off any grease spots on the siding with a cleaning rag dipped in turpentine so paint will adhere.
10. Return all equipment, and clean the work area.

ACTIVITY 65B AND C

Painting and Decorating

Today some students in your group will paint interior surfaces of the structure (Problem 1), and others will paint the exterior (Problem 2). If a second coat of paint (Problem 3) is applied on the following day, the two crews are to switch jobs.

Problem 1

Objective

Using the proper equipment and supplies, paint the interior walls and trim.

Equipment (Subgroup: 2 or 3 students)
1 flat mixing paddle
1 container for paint (1 lb. coffee can)
1 1½" paint brush
1 roller and pan

Supplies (Subgroup: 2 or 3 students)
1 pt. latex-base interior paint
liquid detergent
masking tape
paper towels, newspapers, rags

Preparing to Work

1. Get the needed equipment, and about 1 pint of interior paint.
2. Spread newspaper on the floor of the structure. If it slides away from the edge of the baseboard, tape it to the shoe molding with masking tape. If there is prefinished paneling on the short wall, mask it carefully.
3. Stir the paint. Pour some into the roller tray.

Painting

4. Paint the trim and window casing first, using a brush. See Fig. 65BC-1. Do not overload your brush.
5. Use the roller to cover large, flat surface areas. Paint narrow sections with a brush.
   Note: When applying paint to a roller, do not overload it. Get just enough paint on the roller to cover the surface evenly. Apply the paint in overlapping vertical strokes, from the top down.
6. When the painting is completed, remove all the masking tape.

Cleaning Up

7. Wipe up any paint splatters promptly with a rag dipped in water.
8. Pour the excess paint from the roller tray back into the paint container. Clean the tray, roller, and brushes with detergent and water as shown in the demonstration.
9. Have your teacher check the cleaning job. Then wrap the roller and brush in paper toweling to allow them to dry without curling.
10. If paint has collected in the lip of the can, wipe it dry before sealing the top. Follow your teacher's directions concerning any leftover paint.
11. Return all equipment and supplies.

Fig. 65BC-1. Painting Interior Trim

Problem 2

Objective

Using the proper equipment and supplies, paint the exterior siding and trim.

Equipment (Subgroup: 2 or 3 students)

1 flat mixing paddle
1 container for paint (1 lb. coffee can)
2 3″ paint brushes
1 1½″ paint brush

Supplies (Subgroup: 2 or 3 students)

½ qt. latex-base exterior paint
liquid detergent
paper towels, newspapers, rags

Preparing to Work

1. Get the needed equipment and about ½ quart of exterior paint.
2. Spread newspaper on the laboratory floor around the exterior walls that are to be painted.

Painting

3. Begin painting the exterior of the structure from the top down, Fig. 65BC-2. Paint the trim and clapboard *edges* first, then the flat areas. After spreading several brushfuls in this manner, finish large areas with sweeping brush strokes, using the tips of the bristles to "feather" (smooth) the paint and give the job a professional look. *Do not overload your brush. Dip it in the paint only half the bristle length.*
4. Spot the paint on; that is, lay the brushload in two or three spots, rather than one. Then blend the spotted areas together.

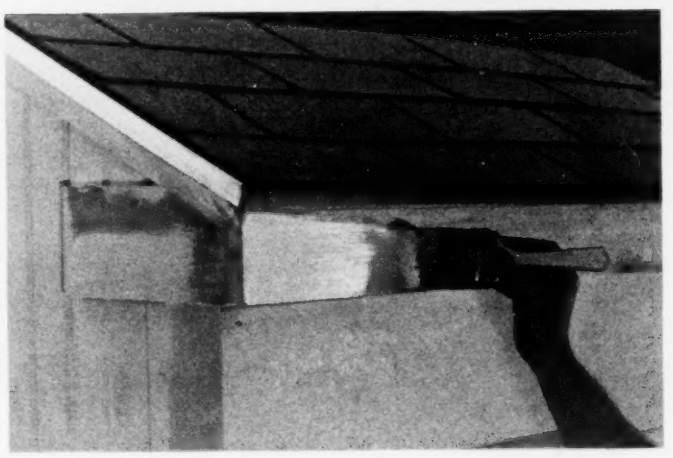


Fig. 65BC-2. Painting Exterior Trim

Cleaning Up

5. Wipe up any paint splatters with a damp rag.
6. Clean the brushes with detergent and water, and have your teacher approve the cleaning job.
7. Wrap the brushes in paper toweling to prevent the bristles from curling.
8. If paint has collected in the lip of the can, wipe it dry before sealing the top. Follow your teacher's directions concerning any leftover paint.
9. Return all equipment and supplies.

Problem 3

Objective

Using the proper equipment and supplies, apply a second coat of paint.

Note: Your teacher will tell you whether or not a second coat of paint is to be applied, after the first coat has dried for a day. Apply the second coat according to the directions given in Problem 1 (interior) or Problem 2 (exterior).

ACTIVITY 66A

Installing Accessories

Today electrical fixtures are to be installed. Your teacher will advise you about how the tasks are to be divided.

Problem

Objective

Using proper equipment and supplies, install the following fixtures in your structure:

a. duplex convenience outlet,
b. porcelain lamp receptacle, and
c. toggle switch.

Equipment (Group of 5)

1 pr. long nose pliers
1 pr. electrician's pliers
1 wire stripper *or* electrician's knife
2 screwdrivers

Supplies (Group of 5)

1 parallel ground duplex receptacle with cover plate
1 single-pole toggle switch with cover plate
1 keyless porcelain lamp receptacle
1 solderless connector, for No. 16 wires
2 metal ground clips

Safety Precautions

1. Avoid cutting yourself when stripping wires.
2. Avoid puncturing your hand if the screwdriver should slip when you are tightening electrical terminals.

Preparing to Work

1. Get the needed equipment and supplies.

Installing Duplex Outlet

2. Uncoil the wires from the outlet box, and strip approximately ¾" of insulation from the end of each wire as shown in Fig. 66A-1.
3. Form loops on the end of each wire. See Fig. 66A-2.
4. Fasten white wires to the silver terminals and black wires to the brass terminals. See Fig. 66A-3.

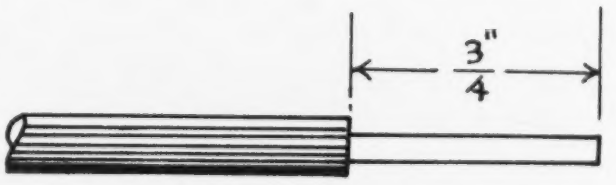


Fig. 66A-1. Wire Properly Stripped

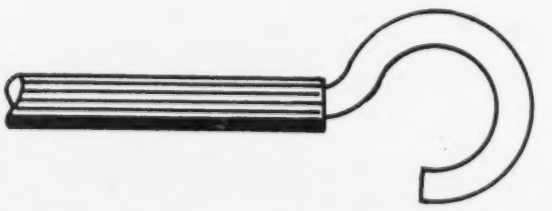


Fig. 66A-2. Wire with Loop Formed

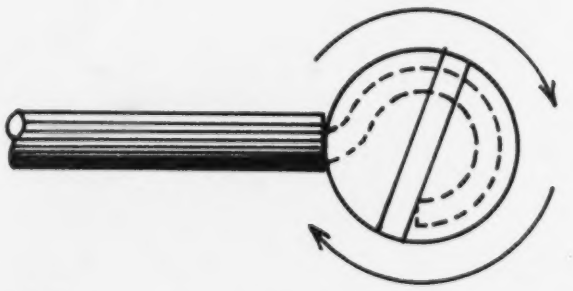


Fig. 66A-3. Loop Turned Clockwise Around Terminal Screws

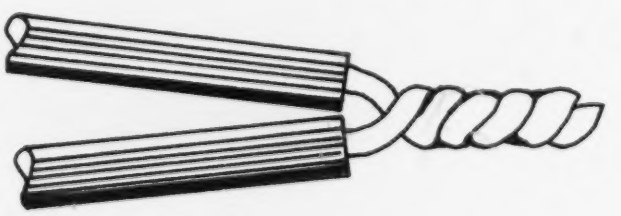


Fig. 66A-4. Wires Twisted Together for Solderless Connector

5. Fasten both ground wires (usually green or bare) to the ground screw (usually green) on the duplex convenience outlet.
6. *Do not fasten the fixtures to the boxes until all connections have been made, and your teacher has inspected them.*

Installing Lamp Receptacle

7. Uncoil wires from the box and strip approximately ¾″ of insulation from the end of each wire.
8. Twist the bare ends of the black wire of the BX cable and the white wire of the Romex cable together, and turn the solderless connector onto the two wires as demonstrated. See Fig. 66A-4.
9. Fasten the two ground wires to a ground clip, and push the ground clip over the edge of the box.
10. Form loops on the ends of the remaining black and white wires, and fasten them to the terminals of the porcelain lamp receptacle.
11. Do not fasten the fixtures to the boxes until all connections have been made, and your teacher has inspected them.

Installing Toggle Switch

12. Uncoil the wires from the box, and strip approximately ¾″ of insulation from each wire.
13. Fasten the ground wire to a ground clip, and press the ground clip over the edge of the box as demonstrated.
14. Form loops on the bare ends of the two wires remaining.
15. Fasten the looped wires to the terminals as demonstrated.

Inspecting Wiring Connections

16. When all connections have been made at each of the three fixtures, advise the teacher that your work is ready for inspection.

Securing Fixtures to Boxes

17. When your wiring has been approved, fasten the duplex convenience outlet, the porcelain lamp receptacle, and the toggle switch to the boxes as demonstrated, and install the cover plates.

Cleaning Up

18. Return all equipment, and clean the work area.

ACTIVITY 66B

Installing Accessories

Today the electrical installation will be completed and inspected.

Problem

Objective

Complete the installation of electrical accessories. Then, using the proper equipment and supplies, connect a 3-prong male plug to the electrical system.

Equipment (Group of 5)

1 wire stripper *or* electrician's knife
1 pr. long nose pliers
1 screwdriver

Supplies (Group of 5)

1 3-prong male plug

Safety Precaution

Use caution in testing electrical systems. Shocks and burns can be serious.

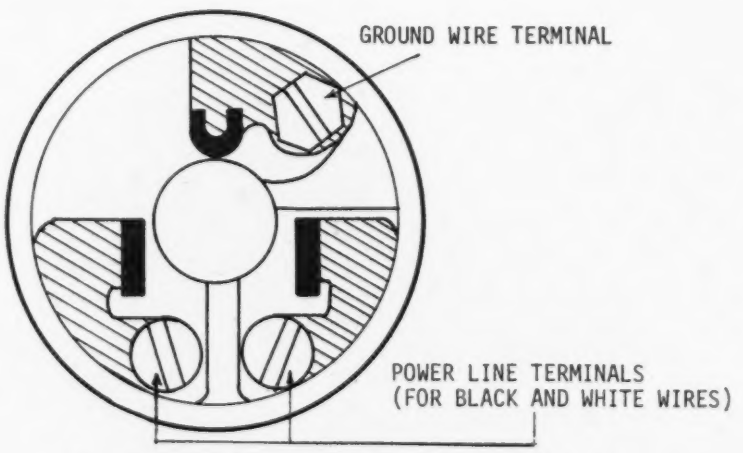


Fig. 66B-1. Three-Prong Male Plug Terminals

Preparing to Work

1. Get the needed equipment and supplies.

Installing Plug

2. Strip approximately ¾" of insulation from the wires leading from beneath the floor.
3. Insert the wires through the male plug.
4. Form a loop on the end of each wire.
5. Place the loops around the terminals:
   a. The black and white wires connect to the terminals of the flat prongs.
   b. The ground wire connects to the shaped prong. See Fig. 66B-1.
6. Tighten the terminal connections.
7. Notify your teacher that the electrical system is ready for inspection and testing.

Cleaning Up

8. After testing is complete, remove the male plug, and return it to the teacher.
9. Return all equipment and supplies, and clean your work area.

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ACTIVITY 67

Completing the Site

Problem

Objective

Using the proper equipment and supplies, prepare the soil and properly plant a tree, shrub, or other plant appropriate to your area.

Equipment (Group of 5)
1 round nose shovel
1 rake
1 pr. wire cutters
1 pr. pliers
1 hammer

Supplies (Group of 5)
1 small tree or shrub
20 lb. peat moss
10 lb. 10-6-4 fertilizer
2 1" x 2" x 6' stakes
2 ft. rubber or plastic garden hose
6 ft. wire

Preparing to Plant

1. Decide on the location for planting.
2. Dig a hole larger than the root ball of the plant to be planted.
3. Mix soil, fertilizer, and peat moss in proportions recommended for your area. A typical formula: 1 shovelful of peat moss, four shovelsful of earth, ½ pint of 10-6-4 formula fertilizer for each 1" of diameter of tree trunk measured one foot above ground level. (This formula will vary according to the type of plant and your geographical area.)

Planting

4. Place the plant in the hole, making sure that the top of the root ball is level with the surface of the surrounding ground.
5. Replace enough of the earth-humus-fertilizer mixture to hold the plant upright.
6. Add the rest of the prepared soil while slowly and steadily pouring water into the hole. "Puddle" the soil firmly around the root ball to eliminate air pockets.
7. Support the plant with stakes, if needed, to hold it vertically. See Fig. 67-1.
8. Build a low-mounded ring around the perimeter of the hole. See Fig. 67-2.
9. Cover the soil surface around the plant with peat moss or other appropriate mulch to help hold the moisture around the roots.

Cleaning Up

10. Rake up and remove excess soil. Clean and store all equipment and supplies.

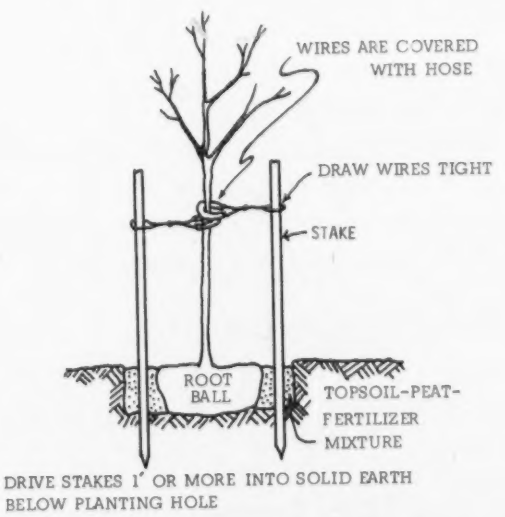
WIRES ARE COVERED WITH HOSE
DRAW WIRES TIGHT
STAKE
ROOT BALL
TOPSOIL-PEAT-FERTILIZER MIXTURE
DRIVE STAKES 1' OR MORE INTO SOLID EARTH BELOW PLANTING HOLE

Fig. 67-1. Tree Properly Planted and Held Firmly with Stakes

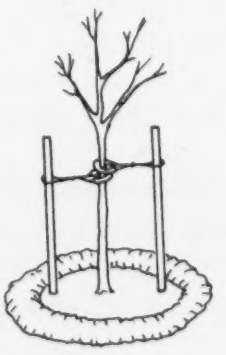

Fig. 67-2. Ring of Soil Built Up Around Trees to Hold Rainfall

ACTIVITY 68

Transferring the Project

Today your wood frame structure will be inspected. The "inspector" (your teacher) will use a detailed checklist to guide him in checking the quality of your work. Then you, as the contractor, will sign a release and warranty in preparation for the "final payment."

Problem

Objective

Using the forms supplied:

a. Record mistakes found in the inspection of your structure.
b. Complete a contractor's warranty form and a contractor's release form.

Observing Inspection

1. Watch your teacher as he inspects each frame wall section, and listen to his comments.

Recording Deficiencies

2. The teacher will note any mistakes in the construction of your structure and record them in the Laboratory Manual of one member of your construction group. You are to copy the mistakes on your punch list. See Chart 68-1.

Signing the Release and Warranty

3. After all the structures are inspected, you are to sign a warranty (Chart 68-2) and a release form (Chart 68-3).

Receiving Final Payment

4. If there are no mistakes, the "owner" (your teacher) will assume full responsibility for the structure as he makes the final payment (your grade).

Chart 68-2

Contractor's Warranty Form

We, the below-signed members of Construction Group ____, do hereby guarantee the quality of workmanship and the materials used in the construction of said structure for a period of one year beginning _____.
(Signed) Members of
Construction Group ____

1. _____
2. _____
3. _____
4. _____
5. _____

Chart 68-3

Contractor's Release Form

We, the below-signed members of Construction Group ____, _____ (do, do not) hereby relinquish all claims and liens against said structure constructed for a course, The World of Construction, Industrial Technology I, during the school year 19__ - 19__. (Signed) Members of
Construction Group ____

1. _____
2. _____
3. _____
4. _____
5. _____

Chart 68-1
Punch List Form
(Record here any mistakes noted during inspection.)

Interior

Walls

Ceiling

Floor

Electrical Power System

Heating and Cooling System

Exterior

Roof

Front

Side

ACTIVITY 69

Servicing Property

Problem

Objective

Using the proper equipment and supplies, perform servicing activities on your structure as indicated during a previous inspection.

Equipment and Supplies

The equipment and supplies you will use today will depend on the type of corrections your structure needs.

Preparing to Work

1. Review Chart 68-1, Punch List Form, completed in Activity 68. It shows what corrections need to be made on your structure.
2. With the help of your group foreman, decide what corrections you will be responsible for making.
3. Get the equipment and supplies you will need.

Servicing

4. Complete your part of the servicing task.

Cleaning Up

5. Clean up your work area, and return all equipment and unused supplies.

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ACTIVITY 70-74

Salvaging

General Instructions

1. For several days you will be clearing a site by dismantling your structure.
2. You are to salvage, clean, and store all materials that are usable.
3. Using the checklist provided for each activity, check off the number of pieces of each item as you remove them from your structure, then check those items in with your teacher.
4. Follow routine procedures about obtaining equipment and about cleaning up the work area each day.

Problem 1 (Activity 70)

Objective

Using proper equipment and a checklist, remove and salvage (1) electric fixtures, (2) trim, (3) ceiling tile, and (4) horizontal siding.

Equipment (Group of 5)

2 screwdrivers
3 claw hammers
2 nail claw *or* ripping bar
1 putty knife (if window glass was installed)

Safety Precautions

1. Before laying a board down, be sure there are no nails sticking up.
2. Pull nails carefully from building materials. Protect yourself and others.

Salvaging

1. Remove and salvage the electrical fixtures, trim, ceiling tile and horizontal siding. See Figs. 70-74-1 and 70-74-2.

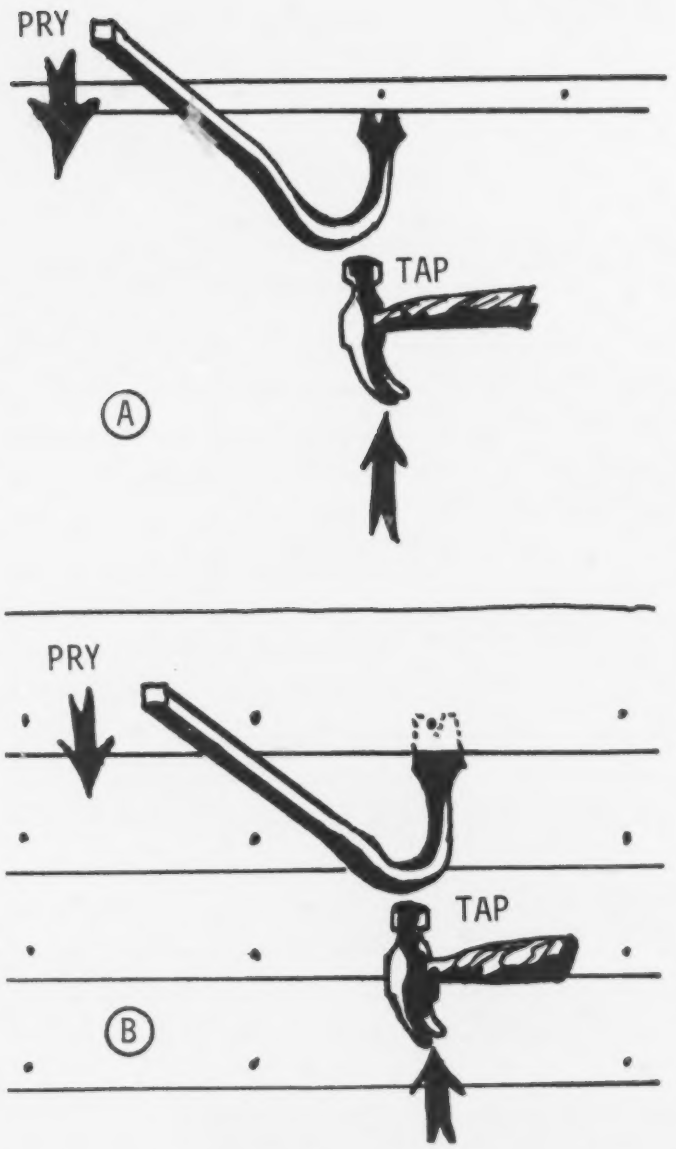


Fig. 70-74-1. Using Nail Claw to Loosen Boards

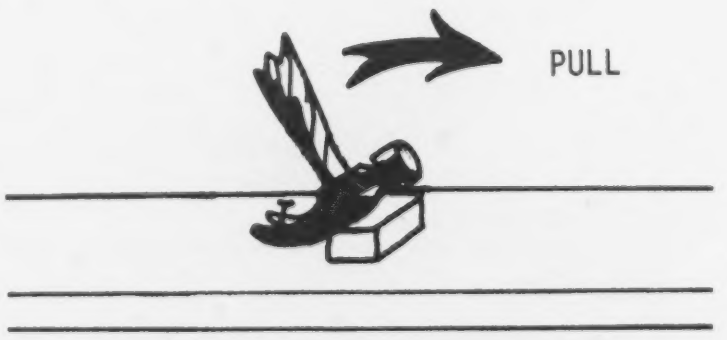


Fig. 70-74-2. Pulling Nail with Hammer and Block

2. Check off the salvaged items in Chart 70-74-1, and check these items with your teacher.

Chart 70-74-1
Activity 70 Checklist

Salvaged Part	No. of Pieces
Window glass	
Cover plate, switch	
Cover plate, duplex	
Lamp receptacle	
Toggle switch	
Duplex receptacle outlet	
Male plug	
Heating duct register	
Ground clips (2)	
Cove molding	
Base shoe	
Window trim (inside)	
Acoustic tile	
Furring strips	
Quarter-round molding	
Horizontal siding	
Starter strip	

Problem 2 (Activity 71)

Objective

Using proper equipment and a checklist, remove and salvage (1) shingles, (2) roofing materials, (3) fascia, (4) rake, (5) soffit, and (6) vertical siding.

Equipment (Group of 5)

2 screwdrivers
3 claw hammers
2 nail claws

Safety Precaution

Do not allow a dropped roofing nail to remain on the floor.

Salvaging

1. Remove and salvage shingles, roofing materials, fascia, soffit, and vertical siding.

2. Check off the salvaged items in Chart 70-74-2, and check these items with your teacher.

Chart 70-74-2
Activity 71 Checklist

Salvaged Part	No. of Pieces
Corner board	
Shingles	
Starter strip	
Building felt (roof)	
Fascia	
Rake	
Soffit	
Vertical siding	
Building felt (wall) (2)	

Problem 3 (Activity 72)

Objective

Using proper equipment and a checklist, remove and salvage (1) the window unit, (2) exterior sheathing, (3) interior wall materials, and (4) plumbing-system parts.

Equipment (Group of 5)

2 screwdrivers
3 claw hammers
2 nail claw *or* ripping bar
1 $\frac{3}{32}$″ nail set
2 pr. slip joint pliers
2 pipe wrenches
1 propane torch (for breaking joint of copper tubing)
1 vise (for breaking joints of galvanized pipe)

Safety Precautions

1. Handle the propane torch and copper tubing with care.
2. If insulation has been installed, care should be taken to prevent skin irritation.

Salvaging

1. To remove the finish nails that hold the window unit:

a. Hold the nail set on the head of a nail.
b. Drive the nail through the trim.
c. *Do not damage the window frame.*

2. Remove and salvage all exterior sheathing, interior wall materials, and plumbing parts.
3. Check off the salvaged items in Chart 70-74-3, and check these items with your teacher.

Chart 70-74-3
Activity 72 Checklist

Salvaged Part	No. of Pieces
Roof sheathing	
Side sheathing	
Window unit	
Front sheathing	
Paneling	
Drywall pieces	
Insulation	
½″ elbows (2)	
½″ caps (2)	
3″ nipples (2)	
12″ galv. pipe	
14″ galv. pipe	
½″ drop-eared elbow (copper)	
14″ copper tubing	

Problem 4 (Activity 73)

Objective

Using proper equipment and a checklist, remove and salvage the (1) wiring system, (2) roof trusses, and (3) wall studs.

Equipment (Group of 5)

2 screwdrivers
3 claw hammers
2 nail claw *or* ripping bar
2 pr. slip joint pliers

Safety Precautions

1. Do not lay down a board with nails sticking up.
2. Pull nails from building materials carefully.

Salvaging

1. Remove and salvage the remaining wiring, roof trusses, and wall studs. See Figs. 70-74-3, 70-74-4, and 70-74-5.

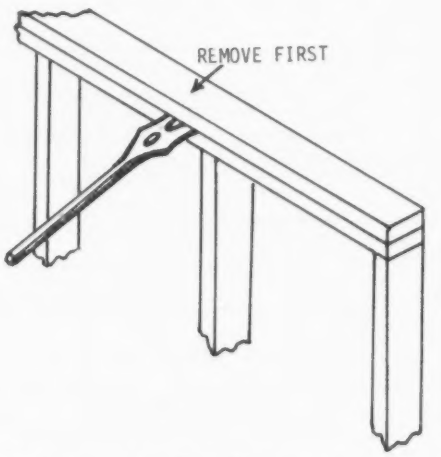


Fig. 70-74-3. Loosening Top Plate

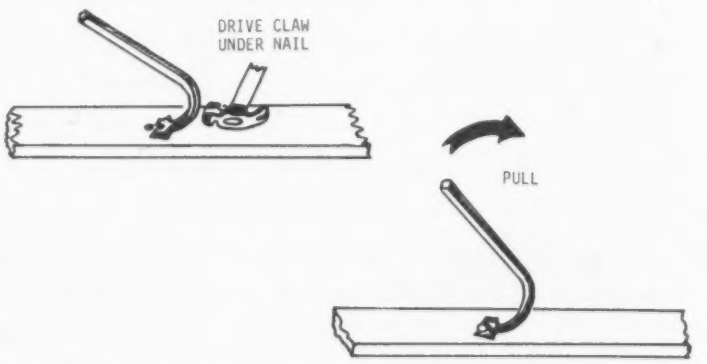


Fig. 70-74-4. Pulling Nails with Nail Claw

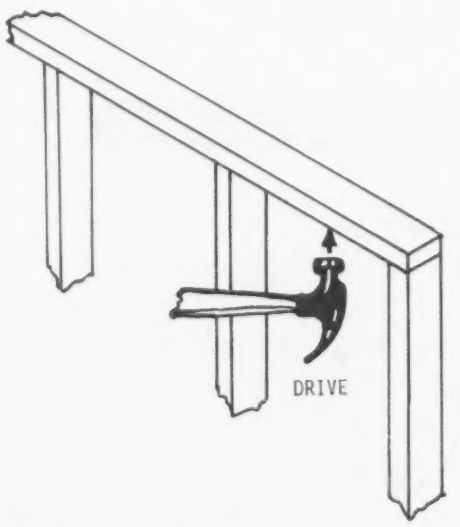


Fig. 70-74-5. Loosening Framing Members

2. Check off the salvaged items in Chart 70-74-4, and check these items with your teacher.

Chart 70-74-4
Activity 73 Checklist

Salvaged Part	No. of Pieces
Wiring, BX	
Wiring, Romex	
Wiring, B &W (3)	
Conduit hanger	
Box connector for conduit	
Conduit	
Box connector, BX (2)	
Switch box	
Outlex box	
Lamp receptacle box	
Bar hanger (lamp receptacle)	
Ridge board	
Upper chord	
Lower chord	
Soffit nailer	
Brace (1x4)	
Chord Braces	
Double plate	
Top plate	
Braces (2x4)	
Studs	
Header (window)	
Sill (window)	
Window framing (4)	

Problem 5 (Activity 74)

Salvaging

Using proper equipment and a checklist, remove and salvage (1) ductwork, (2) floor tiles, (3) bridging, and (4) floor joists.

Equipment (Group of 5)
2 screwdrivers
3 claw hammers
2 nail claw *or* ripping bar

Safety Precautions
1. Do not lay boards down with nails sticking up.
2. Pull nails from building materials carefully.

Salvaging

1. Remove and salvage the ductwork, floor tiles, bridging and floor joists.
2. Check off the salvaged items in Chart 70-74-5, and check these items with your teacher.

Chart 70-74-5
Activity 74 Checklist

Salvaged Part	No. of Pieces
Bottom plate (sole)	
Heat duct	
Floor tile	
Subfloor	
Cross bridging	
Solid bridging	
Header joist	
Floor joists	
Chair glides	
Sill plate	
Girder plate	

ACTIVITY 75

Constructing Housing

Problem 1

Objective

Using your home as a reference, decide whether the rooms and their sizes are adequate or inadequate.

Judging Adequacy of Present Home

1. In Chart 75-1, place a checkmark in the column "Adequate" for each room that is large enough and suitable for its use.
2. Place a checkmark in the column "Inadequate" if a room is too small or unsuitable for its use.

Chart 75-1
Rooms in Your Present Home

Kind of Space	Adequate	Inadequate	None
Bedroom 1			
Bedroom 2			
Bedroom 3			
Bath 1			
Bath 2			
Living Room			
Dining Room			
Recreation or			
Family Room			
Utility Room			
Den or Study			
Car Storage			
Kitchen			

Problem 2

Objective

Using the Construction Laboratory as a reference, estimate room size by pacing off distances.

Equipment (Group of 5)
1 yardstick

Stepping off Distances

1. Each group is to lay out two short parallel lines 3′ apart on the laboratory floor.
2. Place your right toe on one line and left toe on the other. This is a 3′ pace. See Fig. 75-1.
3. With your group lay out two parallel lines 30′ apart.
4. Practice stepping off this distance in exactly ten 3′ paces.

Estimating Laboratory Dimensions

5. Pace the width and length of the laboratory as a way of estimating both dis-

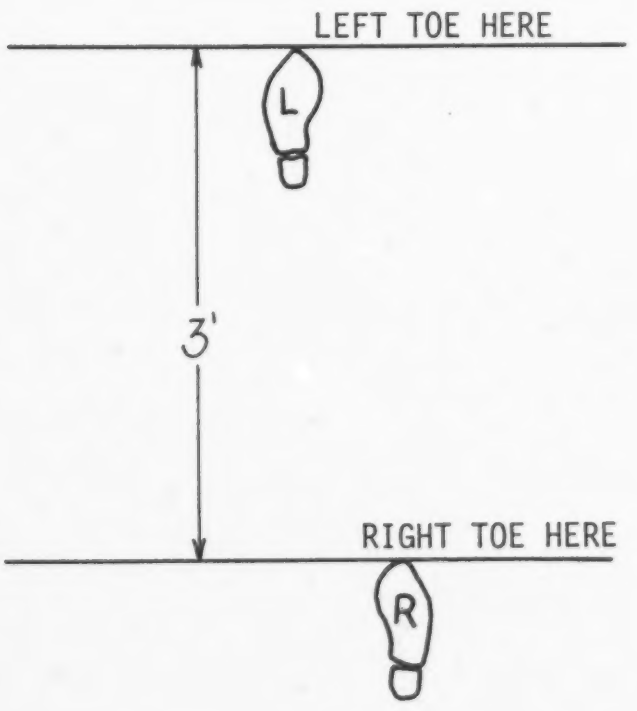


Fig. 75-1. A 3′ Pace

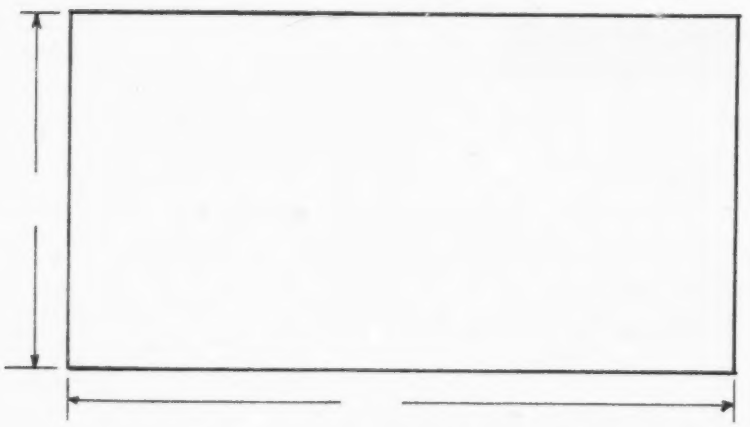


Fig. 75-2. Length and Width of Construction Laboratory

tances. Record your estimates on Fig. 75-2.

6. Your teacher will give you the correct width and length when everyone has finished. If you are wrong by more than 3′, pace the distances again. Check with your teacher if you are still wrong.

Estimating Lot Size

7. Using this pacing technique, you are to estimate the length and width of your yard at home or any area of school ground after school. (Note: If you do not have a yard, you may help a friend estimate the dimensions of his yard.)

ACTIVITY 76

Your Dream House

Problem 1

Objective

Using a checklist, decide the kinds and numbers of rooms desired in your dream house.

Specifying Living Space

1. Complete the checklist in Chart 76-1 for your dream house.

Problem 2

Objective

Using a chart, find how much you can plan to spend for a dream house and lot.

Deciding Income

1. In Chart 76-2 find the column that shows how much education you expect to get. (Education beyond high school might be at a college, technical school or trade school.)

Budgeting for Your Dream House

2. The amounts in the bottom row show how much you can plan to spend for your house and lot. Copy here the amount you will spend:

   $\$$_____.

3. Estimte the cost of the lot as 10% of the maximum amount for house and lot to find the amount that can be budgeted for each.

   Example: To find cost of lot—
   $15,000 cost of house and lot
   × 10 (10%)—cost of lot
   $1,500.00 cost of lot

Chart 76-1
Checklist of Rooms Wanted in Dream House

Kind of space	Number Needed				
	1	2	3	4	5
Bedroom					
Bath					
Closet					
Kitchen					
Dining room					
Living room					
Recreation or family room					
Patio					
Utility room					
Basement					
Entrance hall					
Den or study					
Car storage					

Chart 76-2
Economic Status and Cost of Housing

Income and Housing Budget	Amount of Education				
	Less than High School	High School	H.S. plus 4 Years	H.S. plus 5 Years	H.S. plus 6 Years
Monthly gross pay	$500	$625	$833	$1,250	$1,667
Annual gross pay	$6,000	$7,500	$10,000	$15,000	$20,000
Maximun amount for house and lot*	$15,000	$18,750	$25,000	$37,500	$50,000

*This is 2½ x annual gross pay.

Fig. 76-1. Average Annual Rainfall in Inches

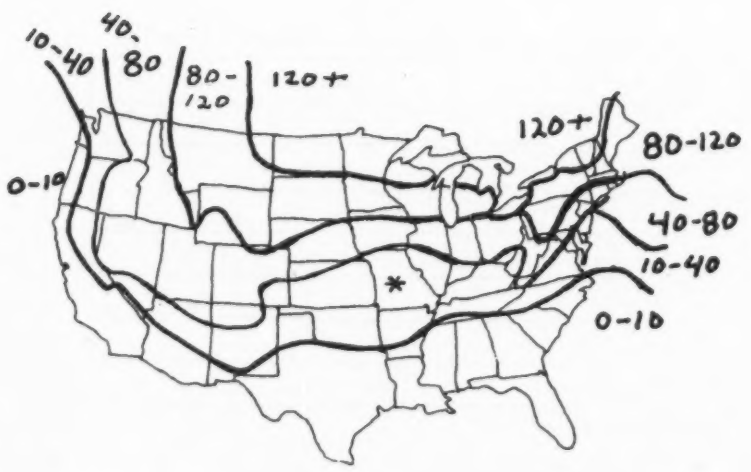


Fig. 76-2. Average Number of Days Per Year with Snow on the Ground

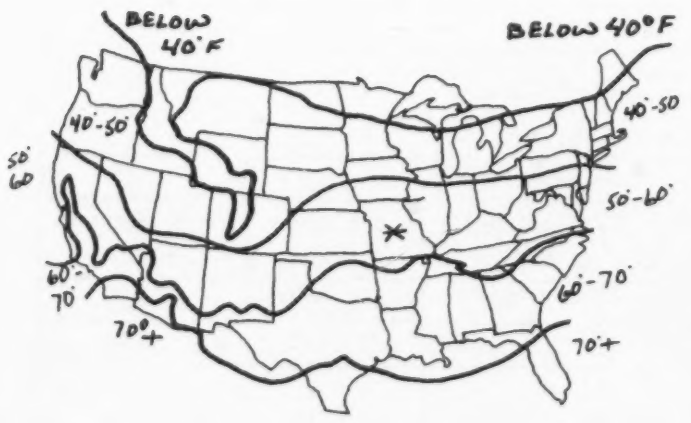


Fig. 76-3. Average Annual Temperature in Degrees F.

To find cost of house—

$15,000 cost of house and lot
− 1,500 cost of lot
$13,500 cost of house

The budget for the house is $_____.

The budget for the lot is $_____.

Problem 3

Objective

1. Using maps, find the average annual temperature, rainfall, and number of snowy days in the region where you want to build your dream house.
2. Using a checklist, indicate what construction materials you expect will be available in the locality of your dream house.

Selecting Location and Climate

1. Figures 76-1, 76-2, and 76-3 are maps. On each map, mark a star (*) where you want to build your dream house. See (*) example in Figs. 76-1, 76-2, and 76-3.
2. Read the climate information for your chosen region, and record it on Chart 76-3.

Chart 76-3
Climate Conditions (Yearly Average)

Rainfall: _____ " per year
Average Temperature: _____ °F
Snow on Ground: _____ days per year

Checking Materials

3. On Chart 76-4, check the construction materials that you expect will be avilable.

Problem 4

Objective

Using a series of pictures, select the architectural style of your dream house.

Chart 76-4
Available Construction Materials

	Yes	No
a. Metal	_____	_____
b. Wood	_____	_____
c. Concrete	_____	_____
d. Glass	_____	_____
e. Plastic	_____	_____
f. Brick	_____	_____
g. Stone	_____	_____
Others (List)		
h. _____		
i. _____		

Selecting a House Style

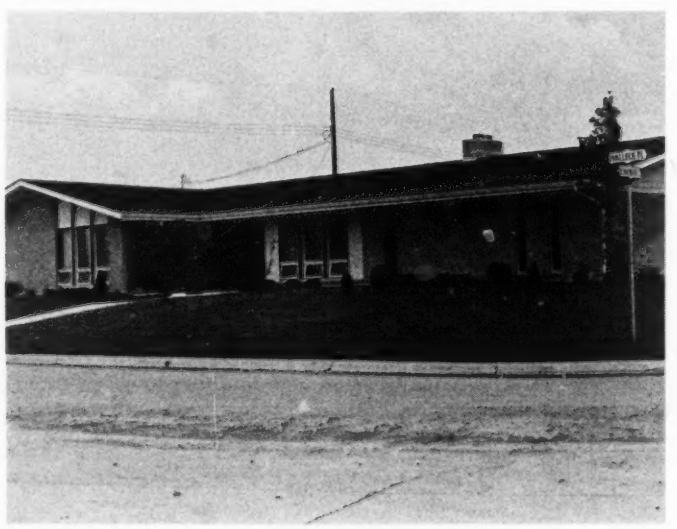
1. **Figure 76-4 is a series of pictures showing various architectural styles. Choose the one you like best.**
2. **Record here the style of the house you chose:**

_____

Contemporary

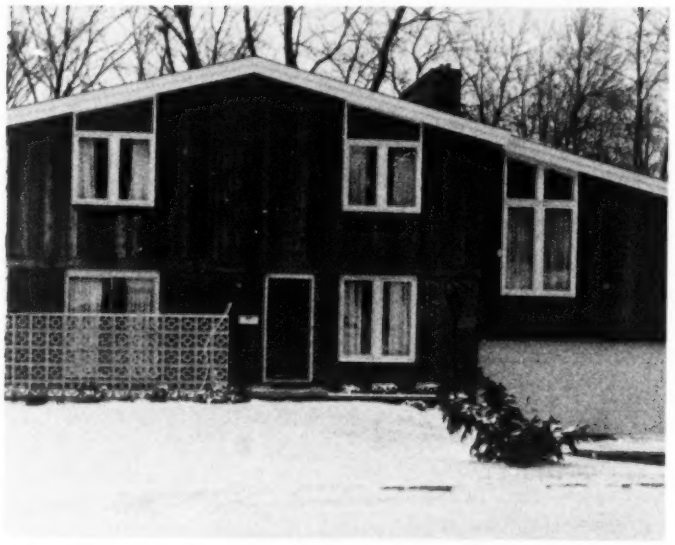
Oriental

Spanish



Ranch

Fig. 76-4. House Styles



Split Level

Split Level

Southern Colonial

Georgian

Tudor

Cape Cod

Fig. 76-4 (continued). House Styles

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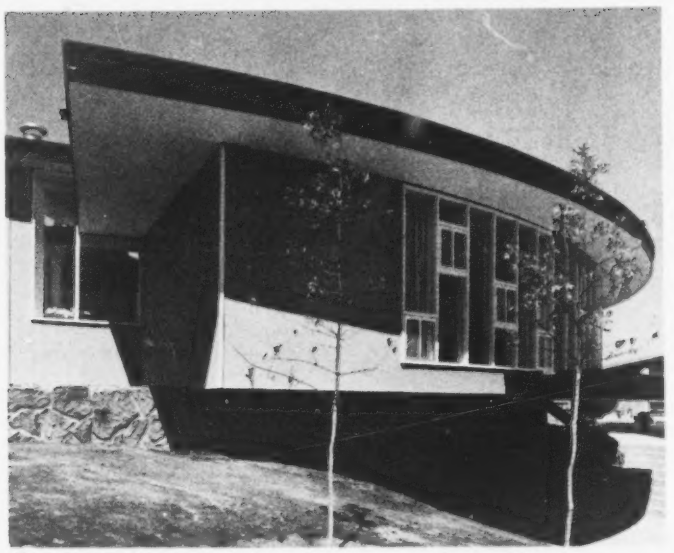
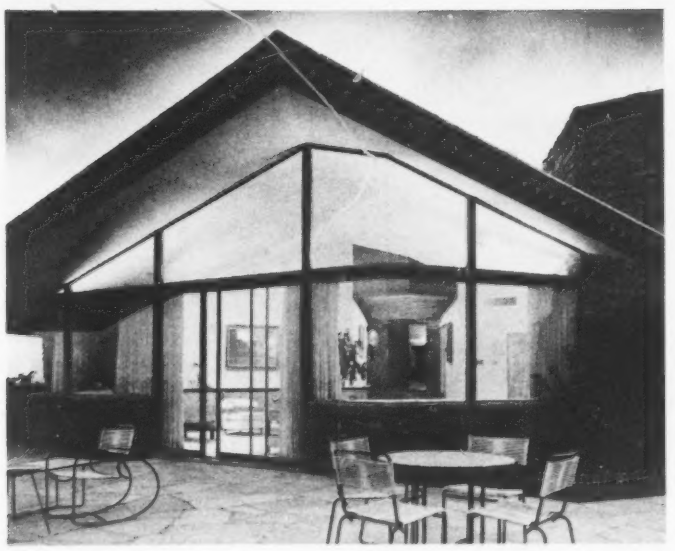
Dutch Colonial



Contemporary



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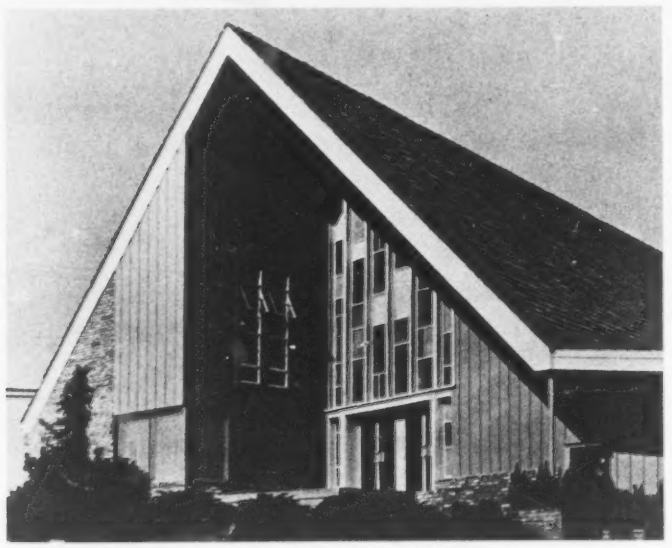

Contemporary

Fig. 76-4 (continued). House Styles

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ACTIVITY 77

Selecting and Purchasing a Lot

Today you will select the lot for your dream house.

Problem 1

Objective

Given a checklist of lot sizes, topography, utilities, services, and prices, select a suitable lot for your dream house.

Selecting a Lot

1. If you want a lot in the country, complete Chart 77-1. Then go to Step 2. If you want a lot in a suburb or small town, complete Chart 77-2. Then go to Step 2.
2. In Activity 76, Problem 2, item 3, you found how much you could spend for a lot. Copy that amount here:

   $_____

3. You have just picked a lot. Does it cost more than your budget allows? If so, go back to Part One of the checklist and change some of your choices. Keep working until you have a lot that you can afford.

Problem 2

Objective

Given an "Offer to Purchase" form, complete it for your dream house lot.

Completing Offer to Purchase a Lot

1. Your teacher will help you complete Chart 77-3. Follow his instructions.
2. Each blank on the chart is numbered so you can refer to each blank by number.

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Chart 77-1
Checklist for Country Building Lot

PART ONE	**Country lot**	X	2
Where do you want your house? (Check one.)	Wooded area	____	5
	Grassy area	____	5
What topography do you want? (Check one.)	Hilly	____	5
	Sloping	____	5
	Level	____	4
	Rocky	____	2
	Rugged	____	1
How big a lot do you want? (Check one.)	100 ′ x 100 ′	____	2
	125 ′ x 200 ′	____	4
	1 acre (200 x 220)	____	8
	More than 1 acre	____	10
What utilities would you like? (Check)	Telephone lines	____	1
	Electrical lines	____	1
What services do you want within 5 miles? (Check as many as desired.)	Fire protection	____	1
	Police protection	____	1
	Church	____	1
	Elementary school	____	1
	High school	____	1
What zone would be best for you? (Check one.)	Farm	____	2
	Farm and mining	____	1
	No restrictions	____	0

PART TWO

At the right is a column of numbers.

Cross out numbers for items *not* checked.

Then add. Write the sum here.

Copy it here. → $.....

Multiply by 100. This is x 100

what your lot will cost. $.....

Chart 77-2
Checklist for Suburban Building Lot

PART ONE	Suburban lot	X	6
Where do you want your house? (Check one.)	Corner of block	____	10
	Middle of block	____	9
What topography do you want? (Check one.)	Hilly	____	10
	Sloping	____	9
	Level	____	7
How big a lot do you want? (Check one.)	75′ x 100′	____	8
	100′ x 150′	____	9
	100′ x 200′	____	10
What utilities would you like? (Check as many as desired.)	Telephone lines	____	1
	Electrical lines	____	1
	Public water	____	1
	Sanitary sewer	____	1
	Storm sewer	____	1
	Natural gas	____	1
What services do you want within 5 miles? (Check as many as desired.)	Fire protection	____	1
	Police protection	____	1
	Hospital	____	1
	Church	____	1
	Elementary school	____	1
	Junior high school	____	1
	High school	____	1
	Shopping	____	1
What zone would be best for you? (Check one.)	Residential (one family)	____	10
	Residential (two or more)	____	9
	Residential & industrial	____	8
	Residential & commercial	____	8

PART TWO

At the right is a column of numbers.

Cross out numbers for items *not* checked.

Then add. Write the sum here. ——→

Copy it here. ——→ $.....

Multiply by 100. This is x 100

what your lot will cost. $.....

Chart 77-3

Offer to Purchase

TO THE OWNER OR PERSON EMPOWERED TO SELL
THE PROPERTY DESCRIBED BELOW:

Property I (We) agree to purchase the following property situated in the (1) _____ of (2) _____ County of (3) _____, State of (4) _____ known as (5) _____ being a (6) _____, together with all lighting, heating and plumbing fixtures, window shades, screen and storm doors and windows, if any, water heater, water meter, and all fixtures and fittings appurtenant to or used in the operation of the premises and owned by you, AT THE PRICE

Price OF (7) _____ Dollars, (8) ($_____), payable as follows:

Deposit (9) $_____ cash deposited with (10) _____ to be held until this offer is accepted, at which time it shall become part of the purchase price, or returned if not accepted.

Balance (11) $_____ cash on or before (12) _____ on passing of deed.

Searches You are to deliver to me, or my attorney, at least five (5) days before closing, a forty-year abstract of title and ten-year search, or tax receipts showing the property free and clear of all liens and encumbrances except as herein set forth, and except building and use restrictions, pole and wire easements of record and subject to zoning ordinance and to any taxes for local improvements not now completed.

Deed Transfer is to be completed at the office of (13) _____ on or before (14) _____ or as soon thereafter as abstracts can be brought to date, at which time you are to convey to me by (15) _____ deed, good title to the property free of all liens and encumbrances, except as herein above set forth, subject to rights of tenants, if any.

Adjustments Interest, insurance premiums, rents, and taxes to be pro-rated and adjusted as of (16) _____, 19__.

Possession Possession of premises shall be delivered on or before (17) _____ on passing of deed.

Upon any purchase money mortgage given, I (we) agree to pay the usual mortgage tax and recording fee and Revenue stamps on bond where required.

The risk of loss or damage to said premises by fire or other causes, until the delivery of the deed, is assumed by you.

I (We) represent that (18) _____ is the broker in this transaction and that no other real estate broker or agent has been instrumental in bringing about this sale.

This offer, when accepted, shall constitute a binding contract of purchase and sale and it shall bind and inure to the benefit of the parties hereto and their respective executors, administrators, distributees, successors and assigns.

Dated (19) _____, 19__ (Signed) (21A) _____ (L. S.)

Witness (20) _____ (Signed) (21B) _____ (L. S.)

ACCEPTANCE

I (We) hereby accept this offer and agree to sell on the terms and conditions set forth, and agree to pay (22) _____ the authorized agent, (23) _____ commission, and the deposit here made, or as much thereof as covers the commission, may be applied thereto.

Dated (24A) _____, 19__ (Signed) (25A) _____ (L. S.)

Witness (24B) _____ (Signed) (25B) _____ (L. S.)

ACTIVITY 78A

Planning the Living Space

Today you will choose the sizes of the rooms for your dream house. You will also find the cost of building, and you will sketch a floor plan.

Problem 1

Objective

Using a checklist, record the rooms you want in your dream house and choose their sizes.

Selecting Rooms

1. In Activity 76, Chart 76-1, you made a list of rooms you want in your dream house. Use this list now as a guide.
2. On Chart 76A-1, place a check in the blank next to the rooms you have decided to put in your dream house.
   Example: ✓ Bedroom

Specifying Room Sizes

3. Decide upon the size of each room and place checks to show your choices.
   Example: ✓ a. 8′ x 10′

Problem 2

Objective

Using Charts 78A-1, 78A-2, and 78A-3, figure the approximate floor area of your dream house, and estimate the building costs.

Finding Floor Area

1. On Chart 78A-2, Step One, enter the names and dimensions of all the rooms you selected in Problem 1, except Bathroom 1, entry rooms, or halls. (See example 78A-2a at the top of the chart.)

Chart 78A-1
Dream House Rooms and Sizes

___ Living Room ___ a. 12′ x 18′ *___ b. 16′ x 20′ ___ c. 20′ x 20′ ___ d. _____	___ Dining Room *___ a. 10′ x 12′ ___ b. 12′ x 15′ ___ c. 14′ x 18′ ___ d. _____	___ Kitchen ___ a. 6′ x 8′ ___ b. 8′ x 10′ *___ c. 12′ x 15′ ___ d. _____	___ Laundry or Utility Room ___ a. 6′ x 8′ *___ b. 8′ x 10′ ___ c. 15′ x 15′ ___ d. _____
___ Master Bedroom ___ a. 10′ x 12′ *___ b. 12′ x 14′ ___ c. 14′ x 18′ ___ d. _____	___ Bedroom 2 ___ a. 8′ x 10′ *___ b. 10′ x 12′ ___ c. 12′ x 14′ ___ d. _____	___ Bedroom 3 ___ a. 8′ x 10′ *___ b. 10′ x 12′ ___ c. 12′ x 14′ ___ d. _____	___ Spare Bedroom, Den, or Study ___ a. 8′ x 10′ *___ b. 10′ x 12′ ___ c. 12′ x 14′ ___ d. _____
___ Family Room or Recreation Room ___ a. 12′ x 16′ *___ b. 14′ x 16′ ___ c. 14′ x 22′ ___ d. _____	___ Bathroom 1 *___ a. 6′ x 8′ ___ b. 6′ x 12′ ___ c. 8′ x 10′ ___ d. _____	___ Bathroom 2 *___ a. 6′ x 8′ ___ b. 6′ x 10′ ___ c. 8′ x 8′ ___ d. _____	Other rooms, if necessary ___ a. _____ ___ b. _____ ___ c. _____ ___ d. _____

*Indicates average room size.

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Chart 78A-2

Building Cost Estimate, Based on Floor Area

Example 78A-2a	Room	Dimensions	Floor Area
	Living room	16′ x 20′	320 sq. ft.
	Dining room	10′ x 12′	120 sq. ft.
	Kitchen	12′ x 15′	180 sq. ft.
	Master bedroom	12′ x 14′	168 sq. ft.
	Bedroom 2	10′ x 12′	120 sq. ft.

Do not include Bathroom 1, entry room, or halls.

Table of Areas 78A-2b

Length of Room, in feet	Width of Room, in feet									
	6′	8′	10′	12′	14′	15′	16′	18′	20′	22′
6′		48	60	72						
8′	48	64	80	96						
10′	60	80	100	120	140	150				
12′	72	96	120	144	168	180	192	216		
14′			140	168	196	210	224	252	280	308
15′			150	180	210	225	240	270	300	330
16′				192	224	240	256	288	320	352
18′				216	252	270	288	304	360	
20′					280	300	320	360	400	
22′					308	330	352			

	STEP ONE		**STEP TWO**
	Room	**Dimensions**	**Floor Area**
	_____	_____	_____ sq. ft.
	_____	_____	_____ sq. ft.
	_____	_____	_____ sq. ft.
	_____	_____	_____ sq. ft.
	_____	_____	_____ sq. ft.
	_____	_____	_____ sq. ft.
	_____	_____	_____ sq. ft.
	_____	_____	_____ sq. ft.
	_____	_____	_____ sq. ft.
	_____	_____	_____ sq. ft.
	_____	_____	_____ sq. ft.
	_____	_____	_____ sq. ft.
	_____	_____	_____ sq. ft.
STEP THREE:	Combined floor area		
STEP FOUR:	10% of combined floor area		
STEP FIVE:	Estimated total floor area		
	Average cost per sq. ft.		x $15
STEP SIX:	Estimated total building cost		$_____

110 01

Chart 78A-3
Average Building Costs for Three Typical Houses

House Description	Area of These Rooms	+10%	Total Area	Estimated Cost
Five rooms (2 bedrooms) living room, dining room, kitchen)	850 sq. ft.	85 sq. ft.	935 sq. ft.	$14,025
Six rooms (3 bedrooms, living room, dining room, kitchen)	1,000 sq. ft.	100 sq. ft.	1,100 sq. ft.	$16,500
Seven rooms (3 bedrooms, living room, dining room, family room, kitchen)	1,200 sq. ft.	120 sq. ft.	1,320 sq. ft.	$19,800

2. Find the floor area for each room. Use the Table of Areas 78A-2b or multiply. Enter the areas under Step Two.
3. Step Three: add to find the combined floor areas.
4. Step Four: figure 10% of this area.
5. Step Five: add Steps Three and Four to find the estimated total floor area.

Estimating Cost

6. Step Six: multiply the floor area by $15 to find the estimated building cost for your dream house. Copy it here:

$_____

Determining Economic Feasibility

7. Refer to Chart 77-3, item 8. Copy here the price of the dream lot which you bought in Activity 77:

$_____

8. Add the costs from Steps 6 and 7 above. What is the combined cost of the house and lot?

$_____

9. Does this cost fall within the amount you planned to spend, as estimated in Activity 76? See Problem 2, item 3.

____ Yes ____ No

10. If it does not, you will need to adjust the number of rooms or their sizes until you can afford the house (until it is financially feasible). Indicate your changes on Chart 78A-1.
11. Chart 78A-3 shows some average cost figures for houses of different sizes. If you need to replan the rooms of your house, the cost figures in this chart may be helpful.

Problem 3

Objective

Using grid paper and a list of room sizes (Problem 1), you are to sketch each room to size.

Supplies (Each student)
2 shts. 8½″ x 11″ grid paper,
ruled ¼″ x ¼″

Sketching Rooms

1. On the grid paper, sketch one of your rooms to scale. Let each ¼″ square represent 1 square foot of floor area. For example, suppose that you have decided on a living room that measures 10′ x 14′. Figure 78A-1 shows a room of this size blocked out, freehand, on ¼″ grid paper.
2. Record the name and size of this room as in Fig. 78A-1.
3. Skip one or two rows of blocks (to leave space for cutting), and begin sketching

the next room to scale. Count rows and columns of blocks carefully to be sure that you are showing the length and width of the room correctly.

4. Sketch and label each of the rooms you checked on Chart 78A-1.

Identifying Sketches

5. On both your sheets of paper, enter the following:
   a. ROOMS FOR DREAM HOUSE
   b. SCALE: ¼" = 1'
   c. Also enter your name and class section.
6. Store these sketches according to your teacher's instructions.

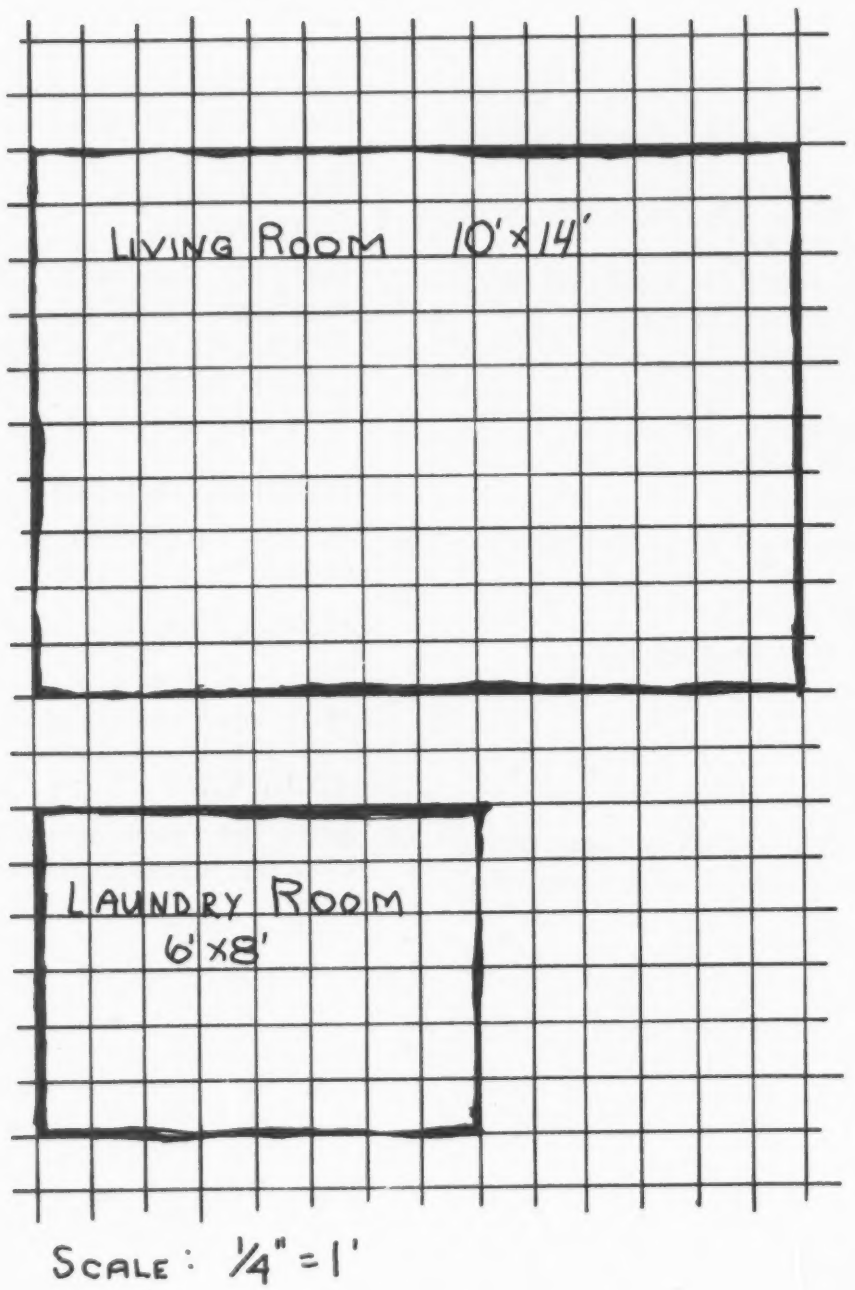


Fig. 78A-1. Rooms Sketched and Identified

ACTIVITY 78B AND C

Planning the Living Space

Problem

Objective

Using ¼" grid paper and room sizes from Activity 78A:

a. Cut out and group the rooms into basic and nonbasic areas.
b. Develop and sketch a workable floor plan for your dream house.

Equipment (Each student)
1 pr. scissors
Supplies (Each student)
1 sht. 12" x 18" grid paper, ruled ¼" x ¼"
2 shts. room sketches from Activity 78A

Preparing to Work

1. Get your equipment and supplies.
2. Cut out the room sketches you prepared in Activity 78A.

Developing the Floor Plan

3. On a sheet of grid paper, arrange your rooms to fit the shape of the house you want, keeping in mind the basic and nonbasic areas of a house. You may need to do this several times before you are satisfied. Figure 78BC-1 gives some examples.
4. At this time you need not plan the closets, halls, or stairways. They will be added in another activity.
5. When you have a plan you like, trace around the individual rooms to form a floor plan sketch on the grid paper.

Identifying Sketches

6. On this rough floor plan, enter the name of each room and the title,

   FLOOR PLAN — ROUGH SKETCH.

   Also record your name.
7. Have your teacher check your floor plan.

Cleaning Up

8. Store the rough sketches as directed, return the scissors, and clean up the work area.

POSSIBLE ONE STORY ARRANGEMENTS

POSSIBLE TWO STORY ARRANGEMENT

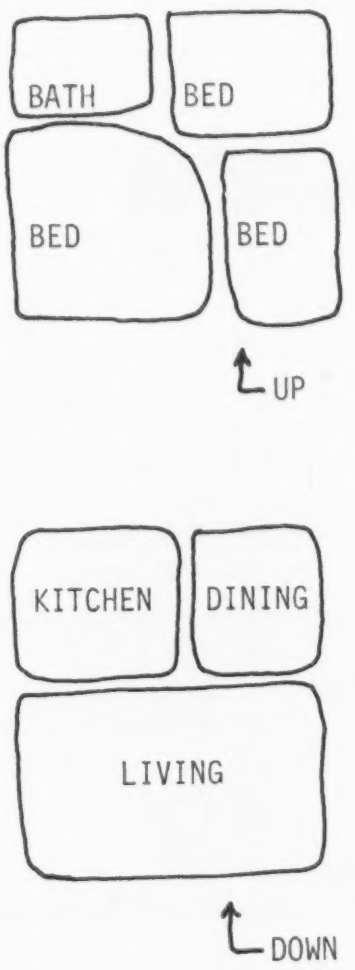


Fig. 78BC-1. Developing Room Arrangements

ACTIVITY 79A

Preparing Working Drawings

Problem 1

Objective

Using a rough floor plan with the basic rooms arranged in proper relationship:

a. Refine the floor plan to include closets and halls.
b. Establish final exterior wall location and shape.

Equipment (Each student)

1 12″ rule

Supplies (Each student)

floor plan sketch from Activity 78C
1 sht. 12″ x 18″ grid paper, ruled ¼″ x ¼″
1 4H pencil
1 2H pencil

Supplies (Group of 5)

1 house plan template

Preparing to Work

1. Get the needed equipment and supplies.
2. Study the rough plan you sketched in Activity 78B and C. Today you will develop a floor plan based on this sketch.

Refining the Sketch

3. Beginning in one corner of a sheet of grid paper, locate and sketch in one room at a time. Allow ¼″ between walls of adjoining rooms as shown in Fig. 79A-1. Note: ¼″ is the thickness of your building materials.
4. Lightly draw all interior walls in place as shown in Fig. 79A-2.
5. Your floor plan sketch did not include space for halls and closets. You will have to decide upon these now, including their size and location, and show them on your floor plan. See Fig. 79A-3.
6. If your home has more than one floor, include a stairway and a plan for a second floor.
7. If you are planning an attached garage, include it on the plan.
8. Make all exterior walls ¼″ thick as shown in Fig. 79A-3.
9. On this drawing print the name of each room. Also print the following:

   FLOOR PLAN: SCALED DRAWING.

10. Record your name and class section.

Problem 2

Objective

Using Chart 79A-1, figure a cost estimate for your dream house.

Chart 79A-1
Computing Building Cost from Floor Plan

Floor Area

_____ ft. x _____ ft. = _____ sq. ft.
(length) (width)

x $15 per sq. ft.

Building Cost Estimate $_____

Calculating Cost

1. To find the overall length and width of your plan, count squares. One square equals 1′.
2. Copy onto Chart 79A-1 the overall length and width of your floor plan. Record to the nearest foot.
3. Multiply the length times the width to determine the area in square feet.
4. Assume that the cost to build your house will average $15 per square foot. Multiply the floor area by $15.

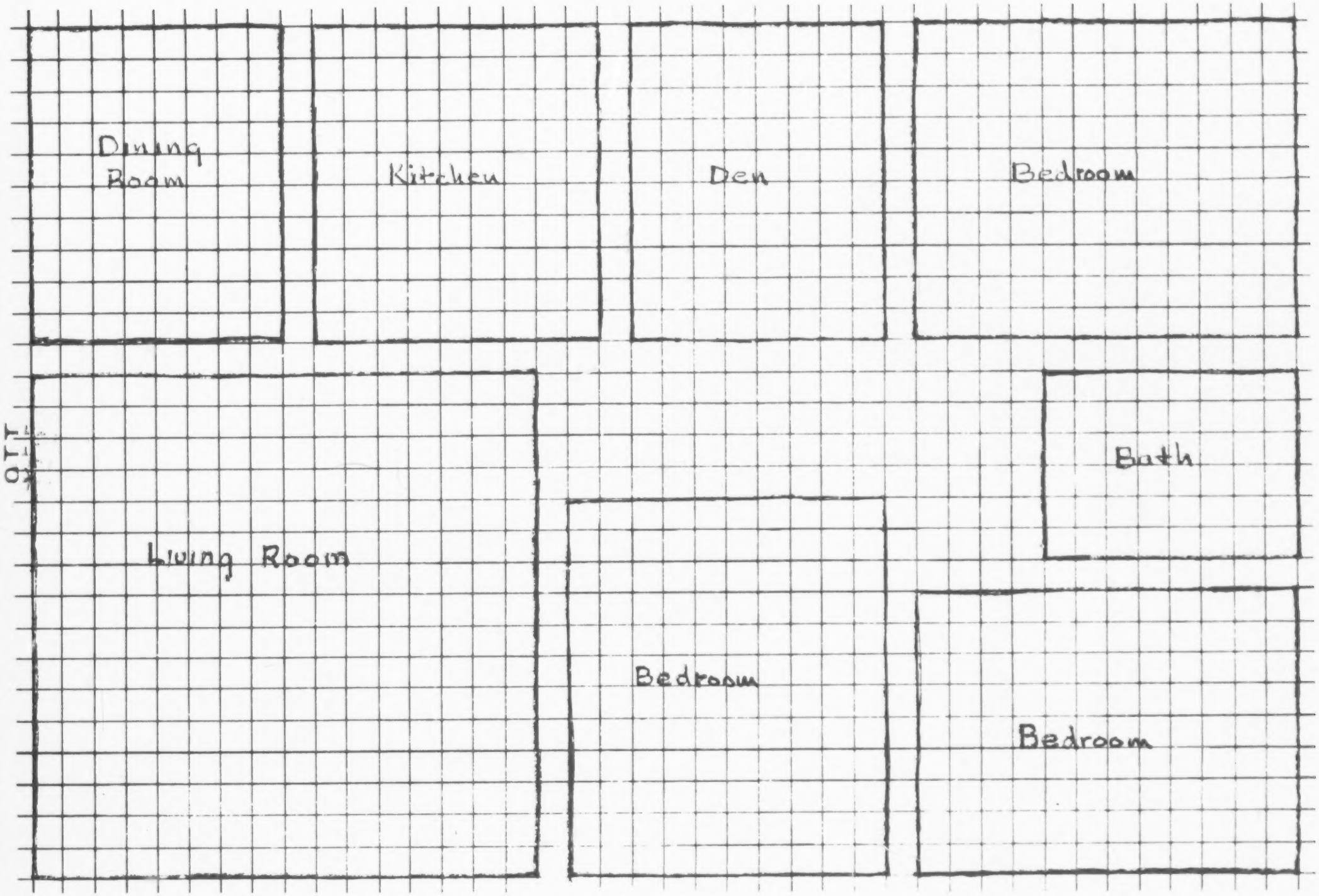


Fig. 79A-1. Locating Rooms

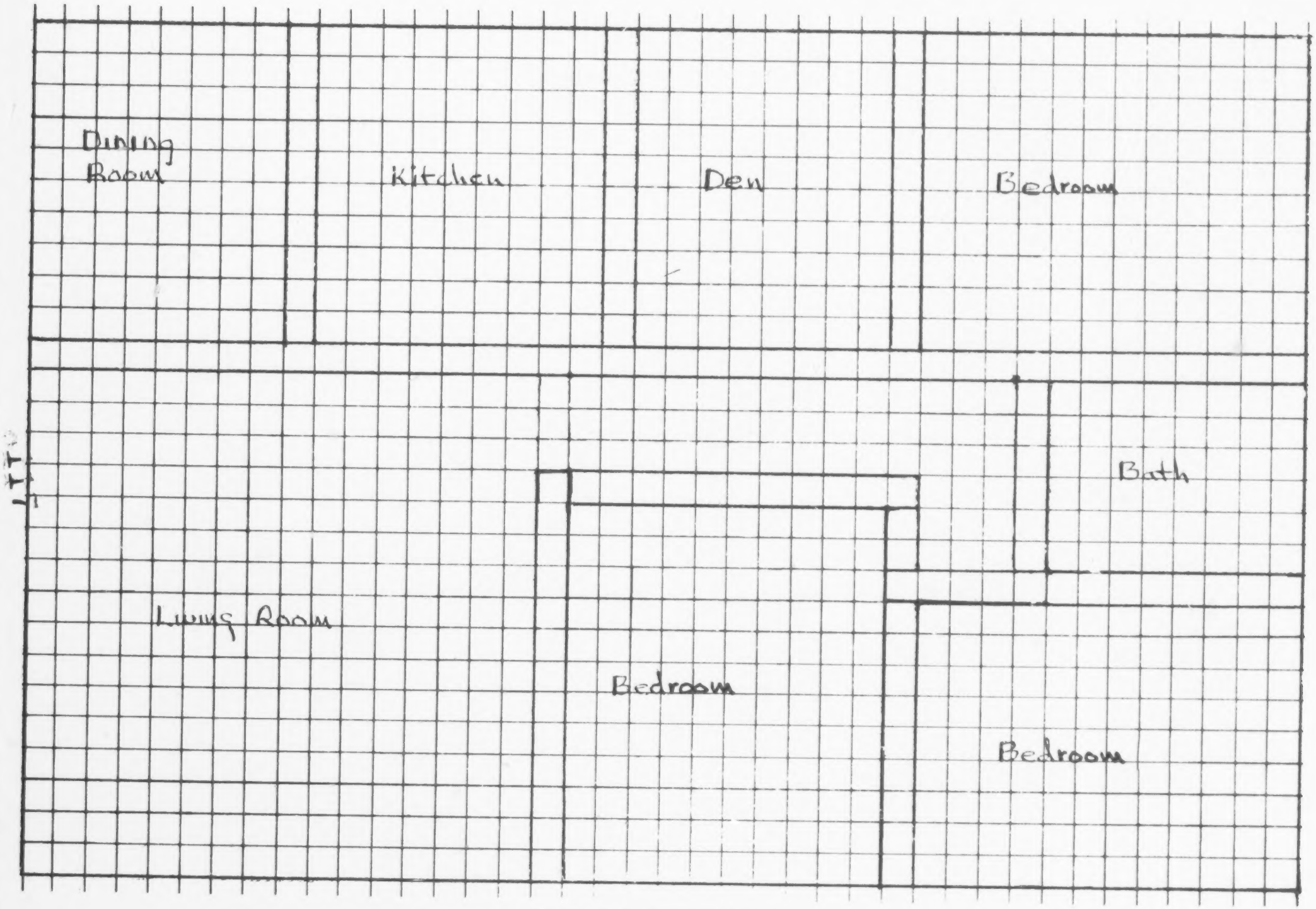


Fig. 79A-2. Drawing in Wall Lines

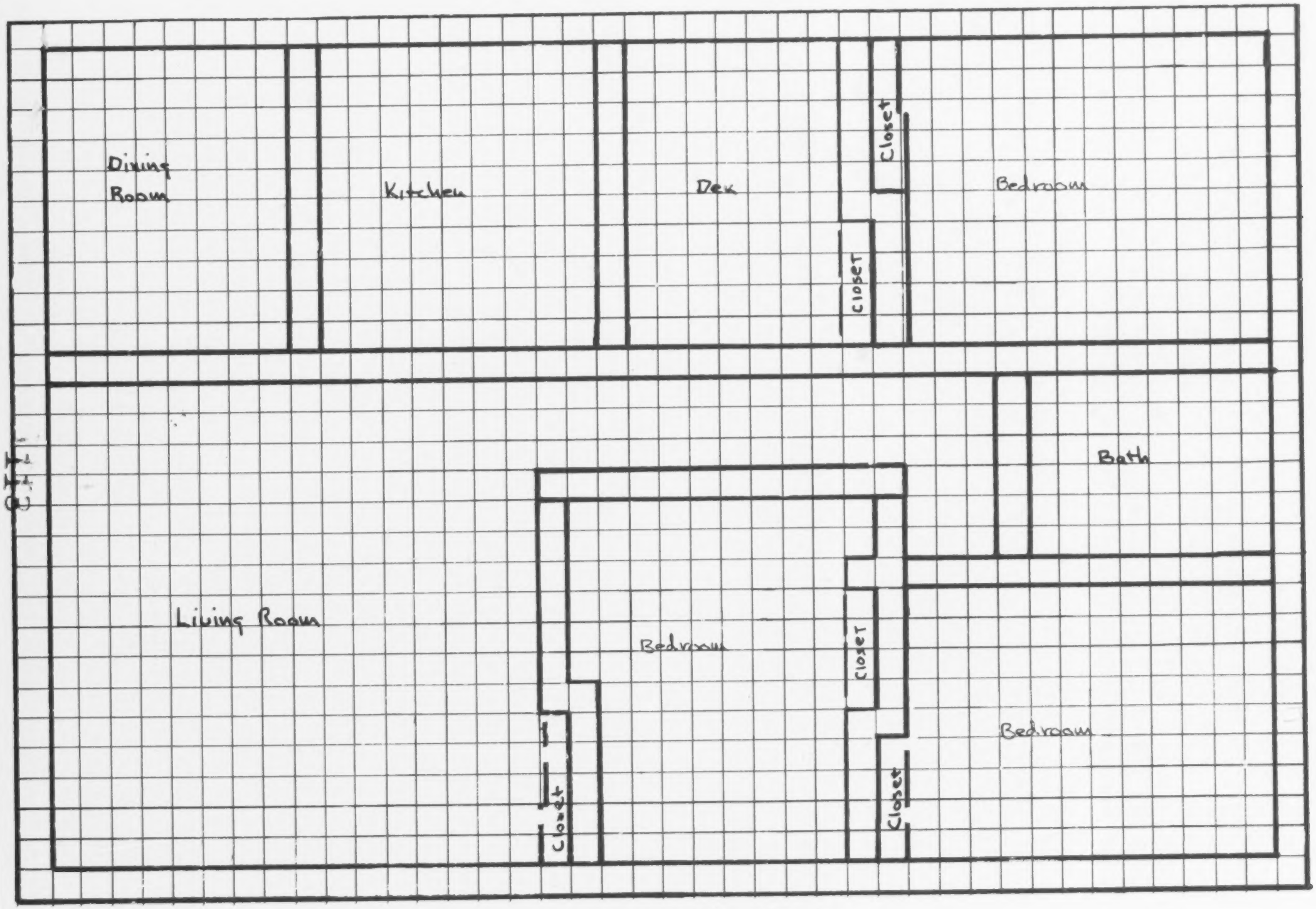


Fig. 79A-3. Sketching in Halls and Closets

Note: This average cost is based on the charges of general contractors in several cities.

5. Check back to Activity 78A, Problem 2, Step 6. Will the cost of your dream house be within your financial means?

   ____ yes ____ no

6. If your answer is "no," cut down the size of your house by taking out rooms or making some rooms smaller.

Cleaning Up

7. Return all equipment, supplies, and drawings to proper storage.

ACTIVITY 79B

Preparing Working Drawings

Objective

Using your dream house floor plan:

a. Locate and lay out doors and windows.
b. Prepare a tracing that shows overall dimensions, room names, and sizes.

Equipment (Each student)

1 12″ rule

Supplies (Each student)

floor plan from Activity 79A
1 sht. 12″ x 18″ tracing paper
1 4H pencil
1 2H pencil
6″ masking tape

Problem

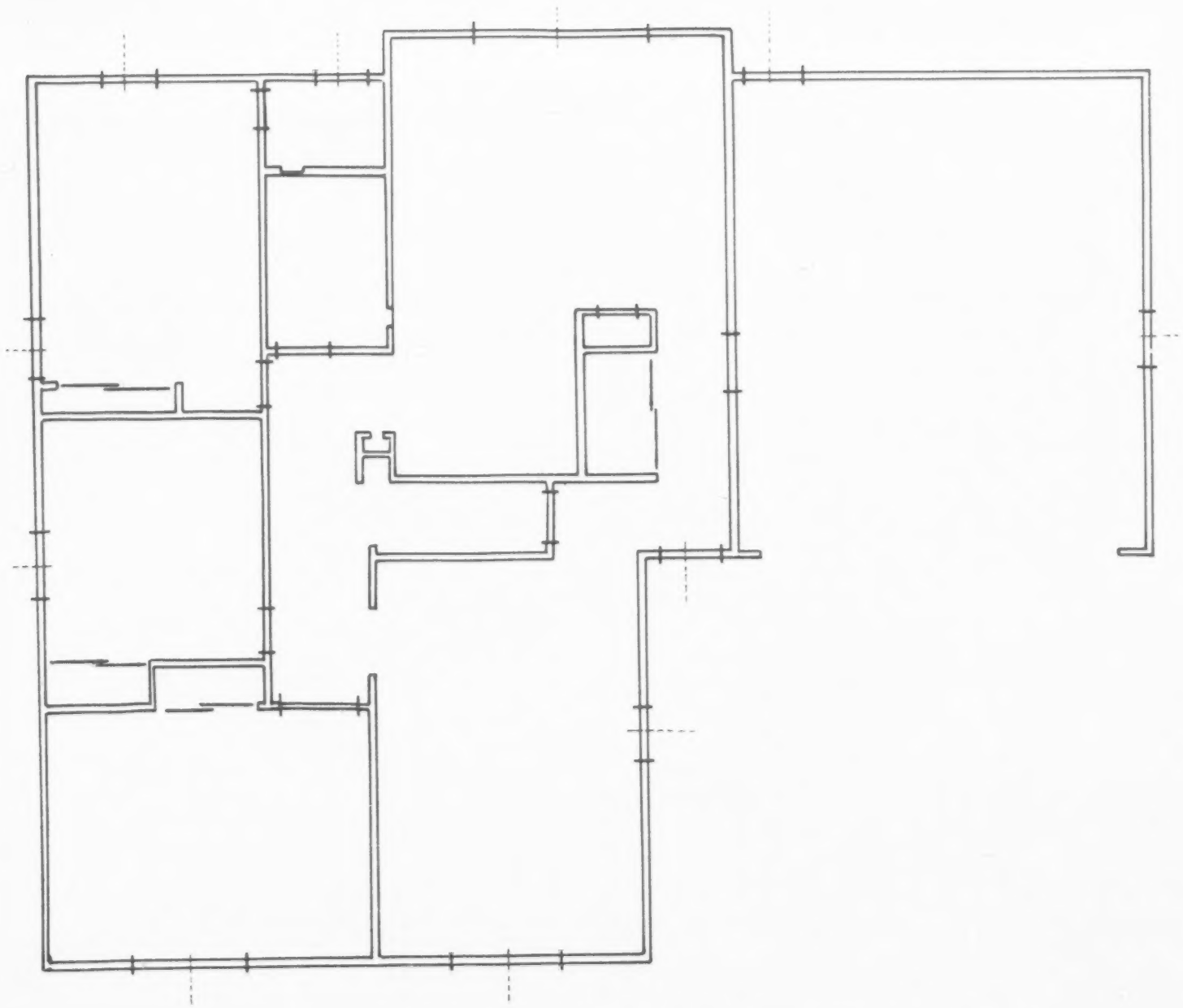


Fig. 79B-1. Floor Plan Showing Locations of Doors and Windows

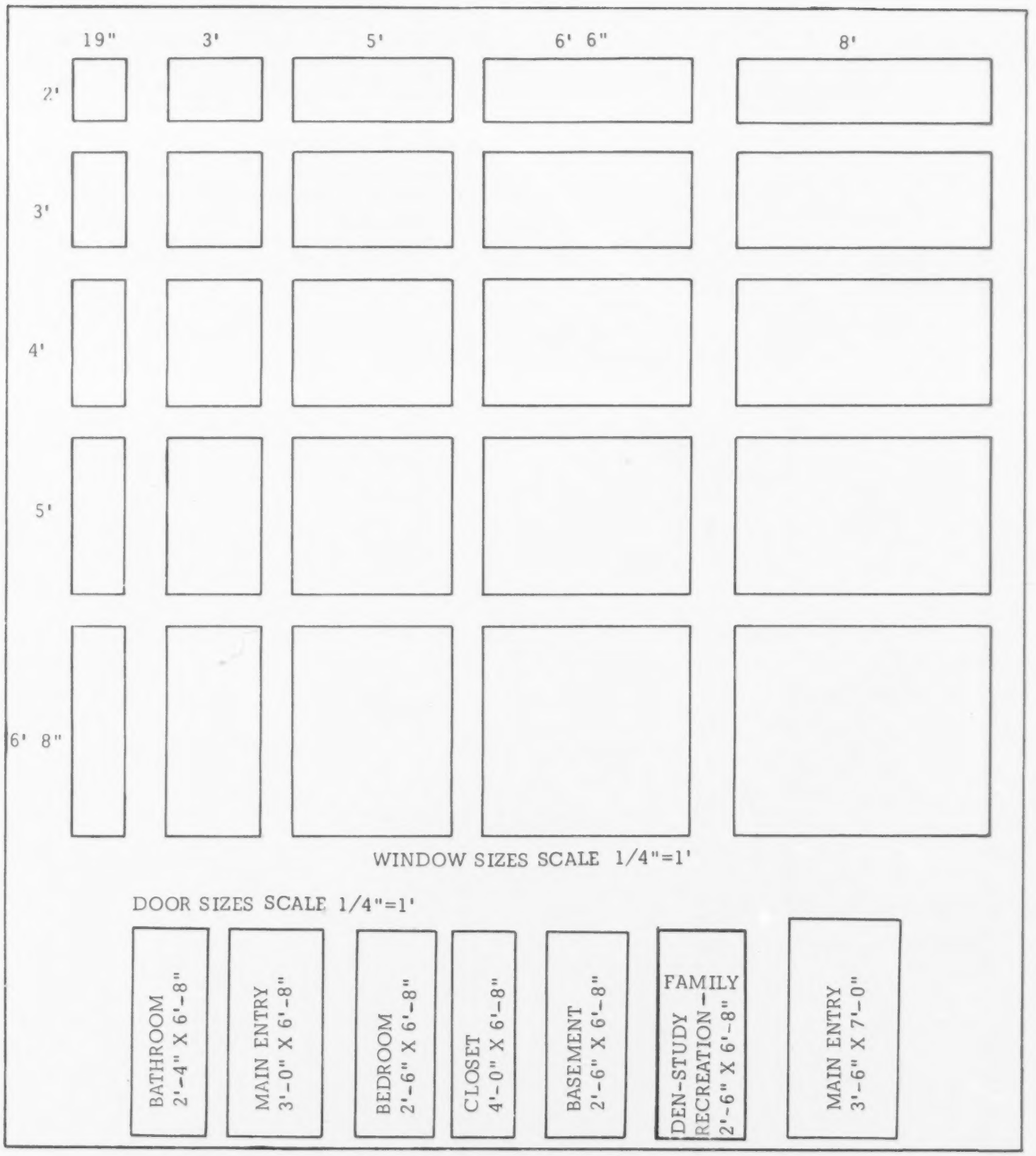


Fig. 79B-2. Sizes of Windows and Doors

Preparing to Work

1. Get the needed equipment and supplies.

Laying Out Wall Openings

2. Locate and lay out the doors and windows on your floor plan as shown in Fig. 79B-1.
3. Use Fig. 79B-2 as a guide for determining common window and door sizes.
4. Add door and window symbols as shown in Figs. 79B-3 and 79B-4.
5. Key your floor plan to show the type of windows and doors you selected. Use Figs. 79B-3, 79B-4, and 79B-5.

   Note: Windows are numbers in circles: ③. Doors are letters in squares: [B].

Tracing Floor Plan

6. Tape a sheet of tracing paper over your floor plan, and trace the plan. Show all walls, closets, windows, doors, dimensions, and room names, as in Fig. 79B-6.

   Note: You do not need to copy the window and door symbols.

7. Letter in the lower right-hand corner of the tracing:

   FLOOR PLAN, SCALE ¼" = 1'

   Also enter your name and class section.
8. If time permits, locate and draw in (a) the kitchen and bathroom fixtures, (b) any other items such as fireplace or furnace, and (c) specific dimensions as shown in Fig. 79B-7.

Cleaning Up

9. Return all equipment, supplies, and drawings to proper storage.

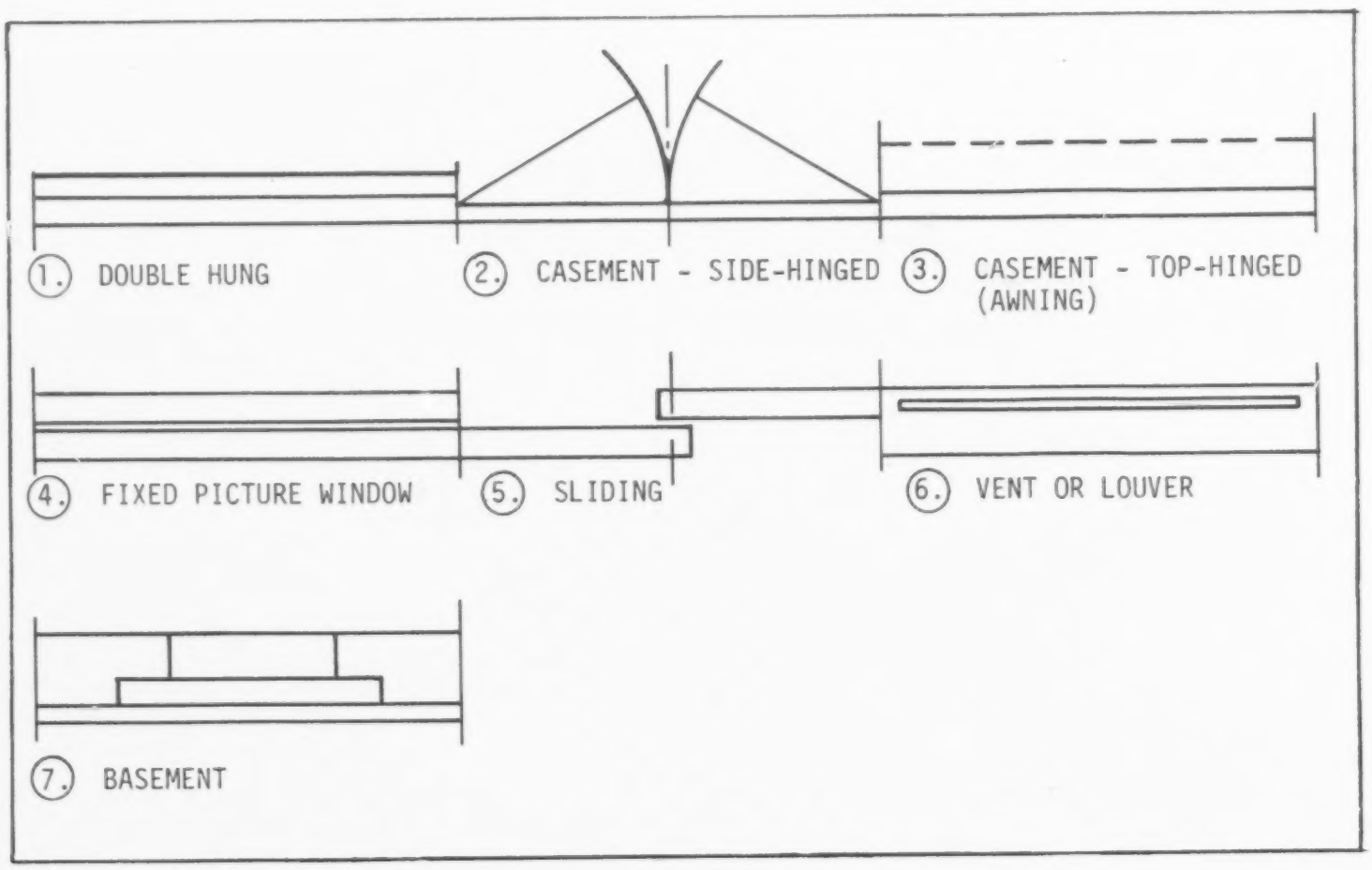


Fig. 79B-3. Window Symbols

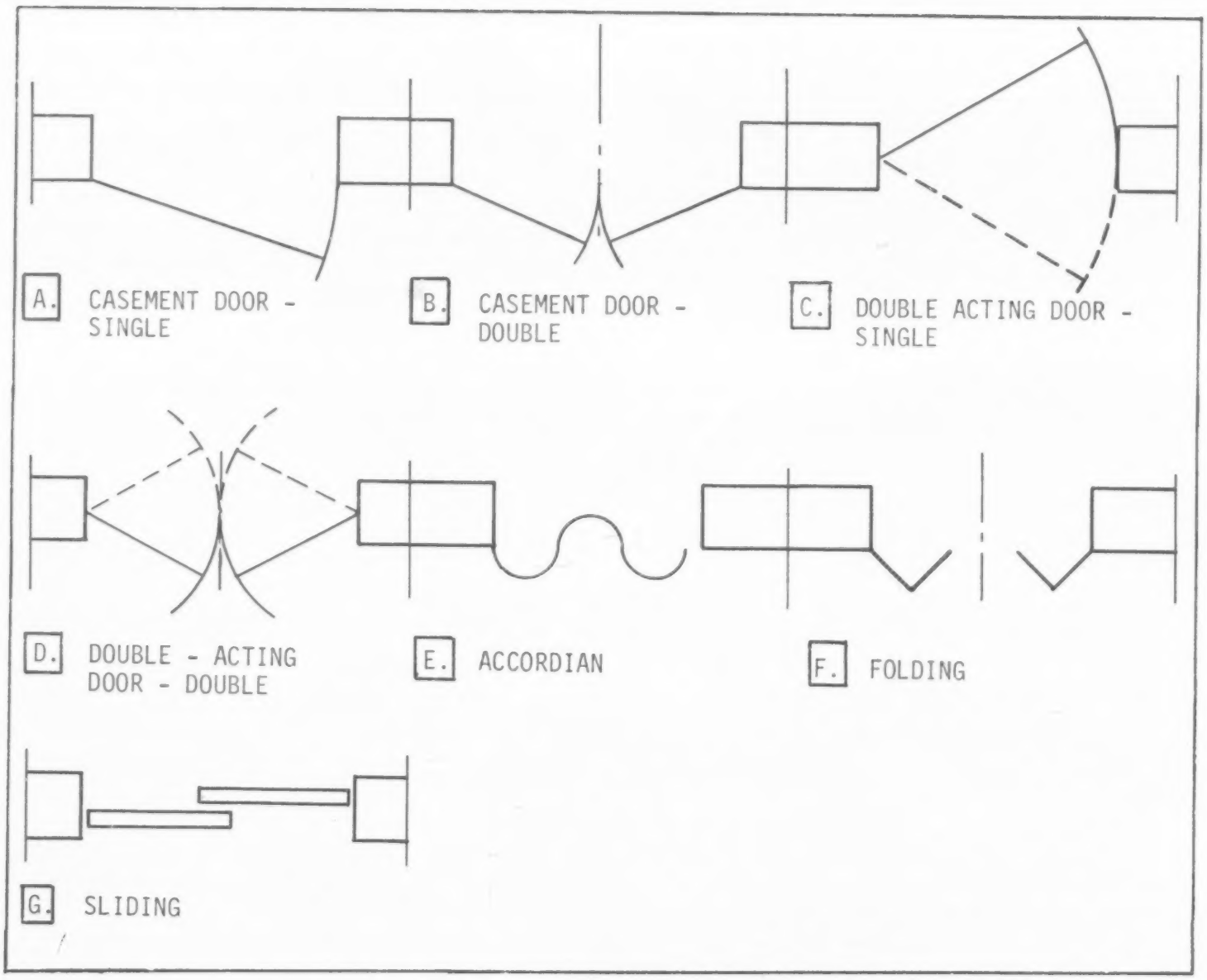

A. CASEMENT DOOR - SINGLE
B. CASEMENT DOOR - DOUBLE
C. DOUBLE ACTING DOOR - SINGLE
D. DOUBLE - ACTING DOOR - DOUBLE
E. ACCORDIAN
F. FOLDING
G. SLIDING

Fig. 79B-4. Door Symbols

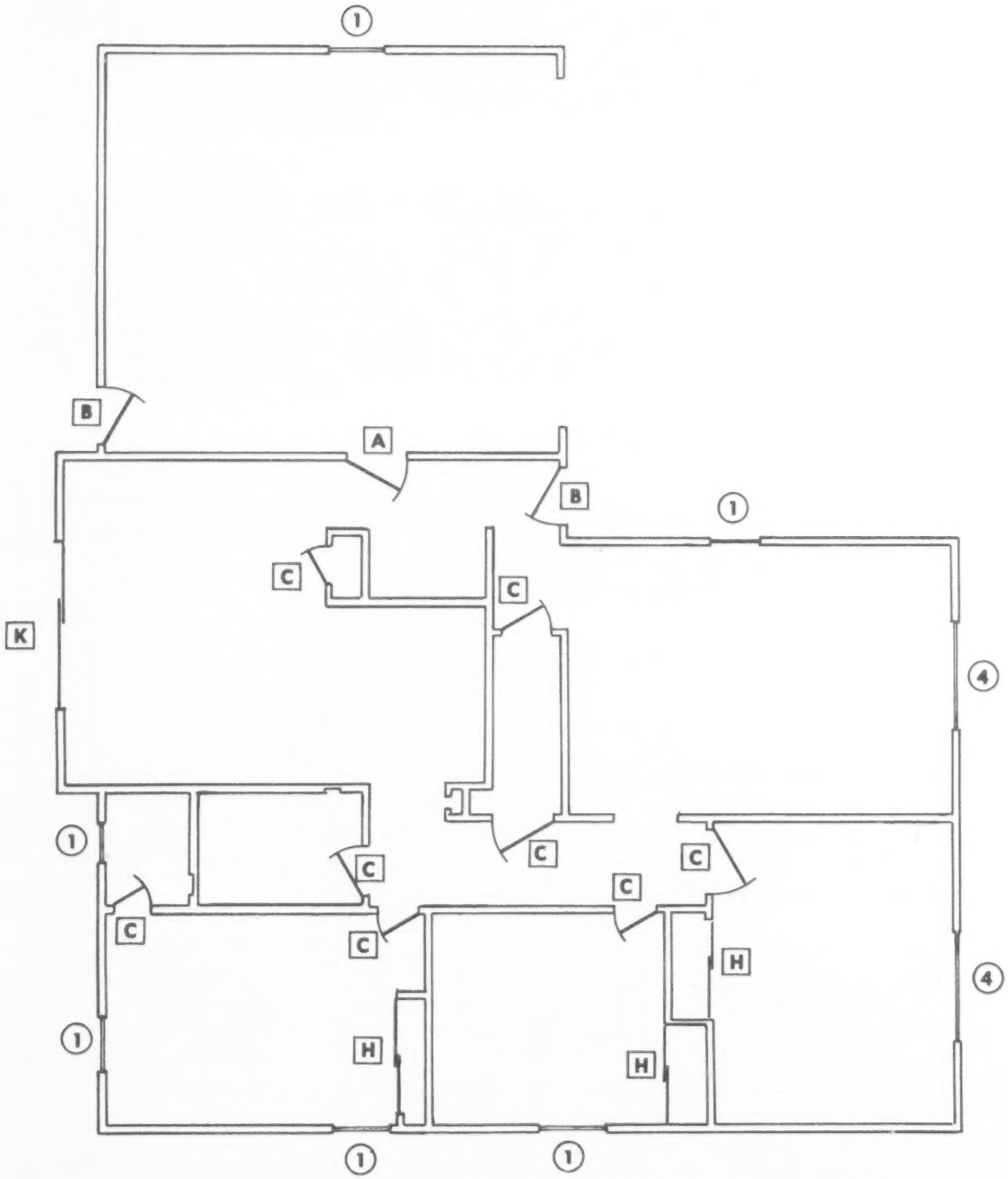


Fig. 79B-5. Doors and Windows Coded

1248a

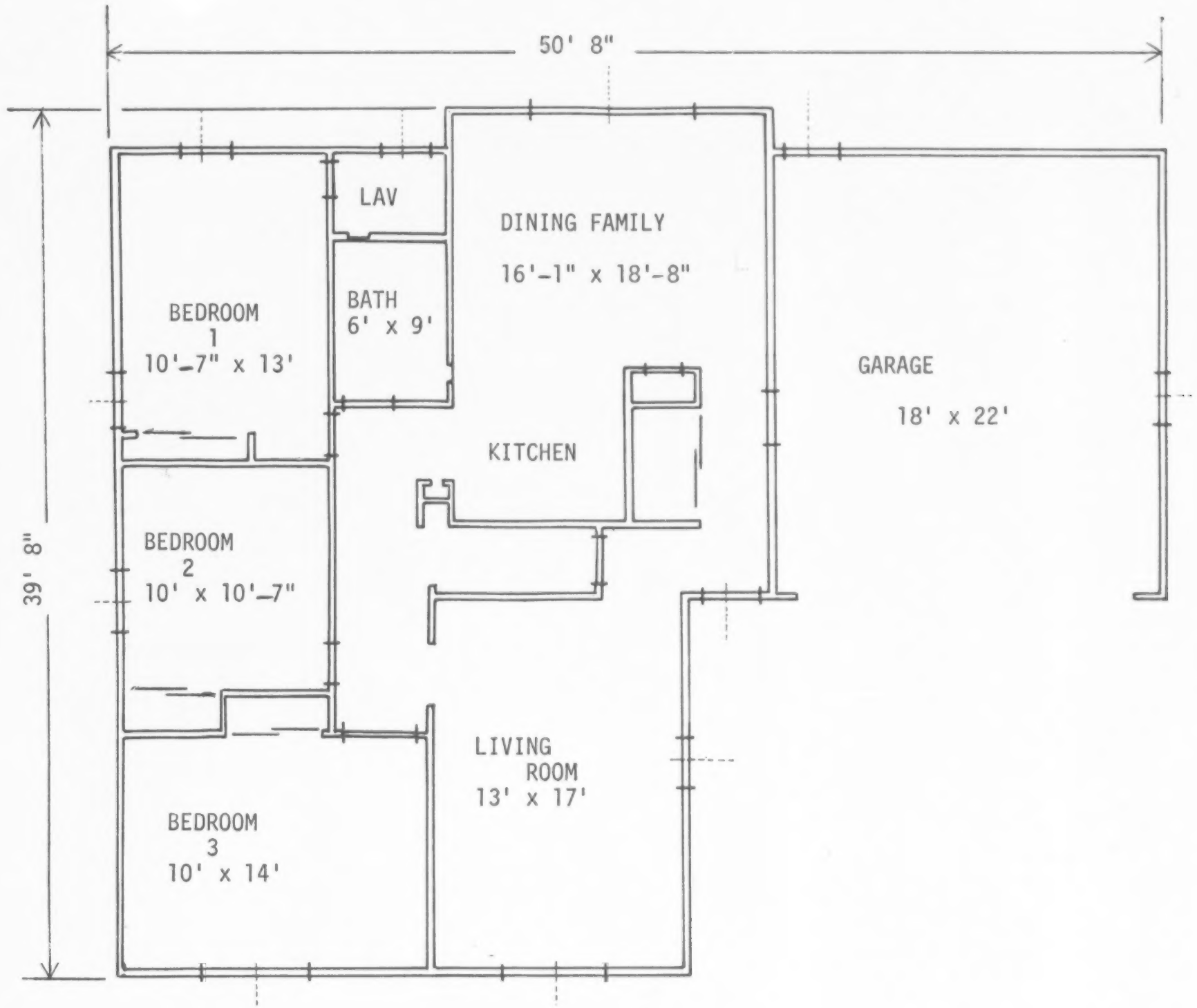


Fig. 79B-6. Floor Plan with Room Names and Sizes

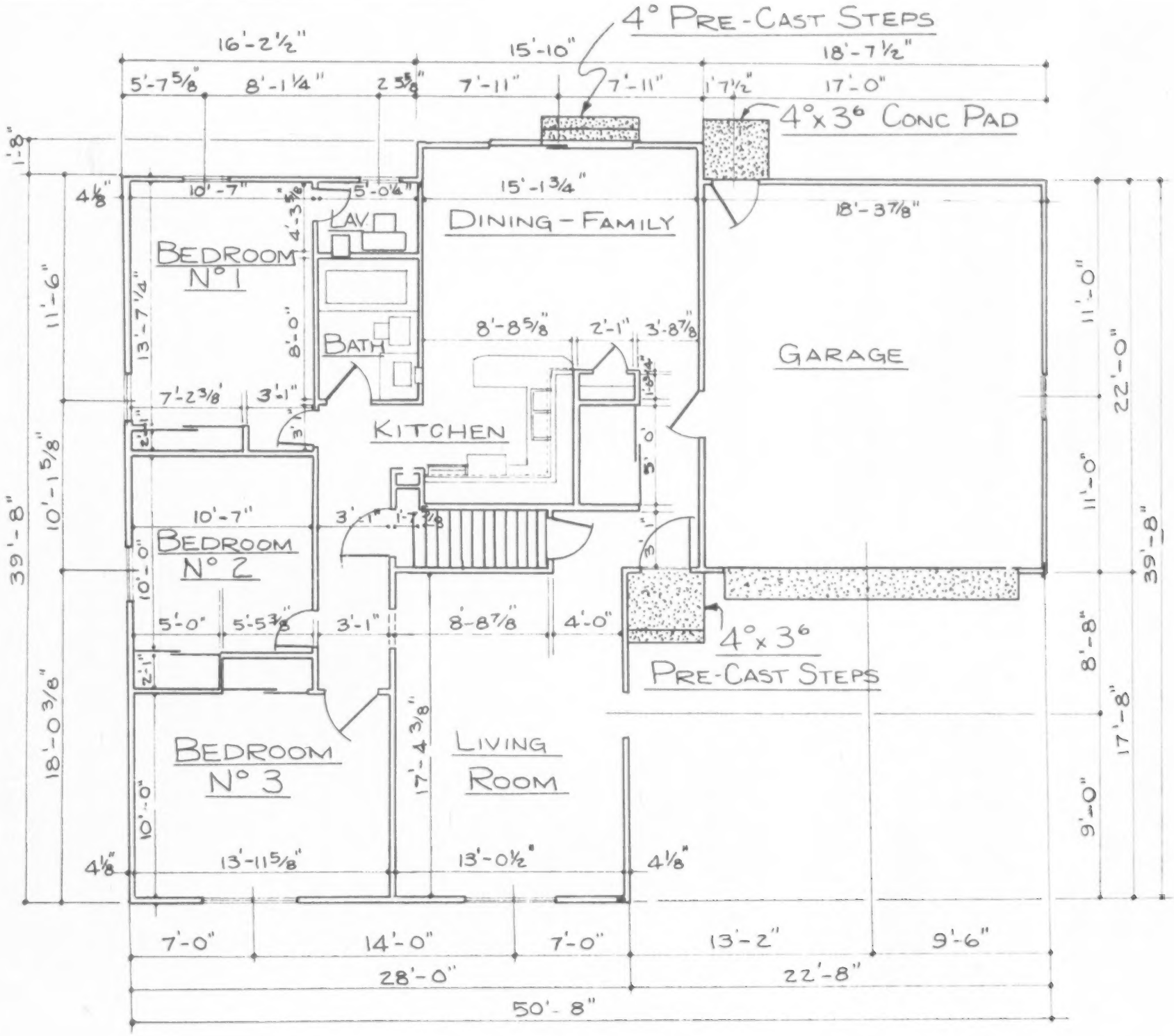


Fig. 79B-7. Completed Floor Plan

ACTIVITY 79C AND D

Preparing Working Drawings

Problem 1

Objective

Using a floor plan, prepare a foundation plan for your dream house.

Equipment (Each student)

1 12″ rule

Supplies (Each student)

1 ea. floor plan and tracing, from Activities 79A and 79B
1 sht. 12″ x 18″ tracing paper
1 4H pencil
1 2H pencil
6″ masking tape

Preparing to Work

1. Get the needed equipment and supplies.

Drawing Foundation

2. The two most common types of foundation drawings and their footings are shown in Figs. 79CD-1 and 79CD-2. You are to draw a slab foundation as a part of your set of working drawings. If you plan to have a basement, use a "T" or spread foundation. If you do not plan to have a basement, use a slab foundation.
3. On the tracing paper, trace the outside line of each exterior wall of your floor plan.
4. Measure and draw dashed lines according to the foundation you selected, as shown in Figs. 79CD-1 and 79CD-2. (¼″ represents 12″ or 1′ drawn to scale)
5. Draw the foundation around the outside line of the house and under the long interior wall runs of the house.
6. On this tracing, letter:

   FOUNDATION PLAN
   SCALE: ¼″ = 1′

   Also enter your name and class section.

Problem 2

Objective

On a floor plan tracing of your dream house, show the locations of electric light fixtures, switches, and convenience outlets.

Drawing Electrical Plan

1. In the living room and kitchen, decide where you will locate lights, electric appliances of all sorts, convenience outlets, and control switches (such as switches for ceiling fixtures). Using your floor plan tracing, very lightly sketch in all these electrical items. See Fig. 79CD-3.

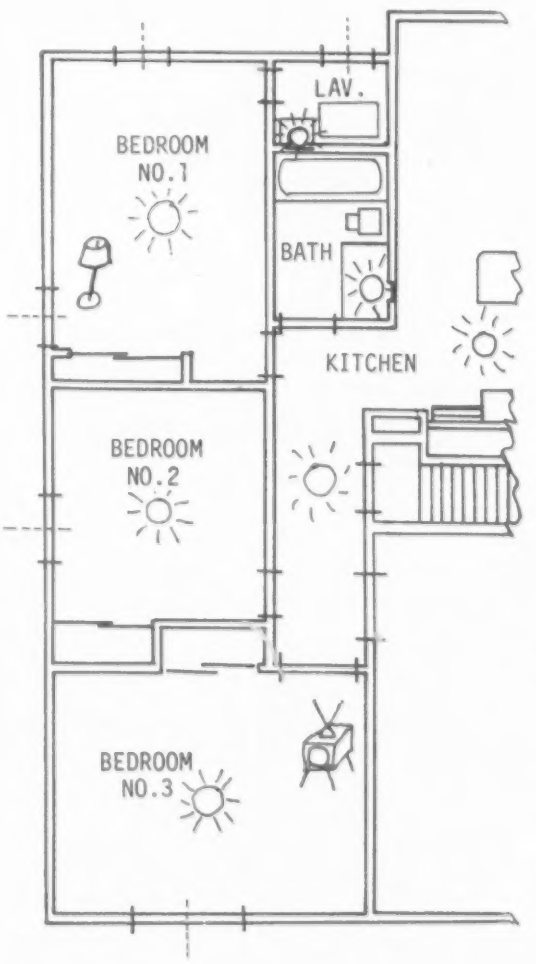
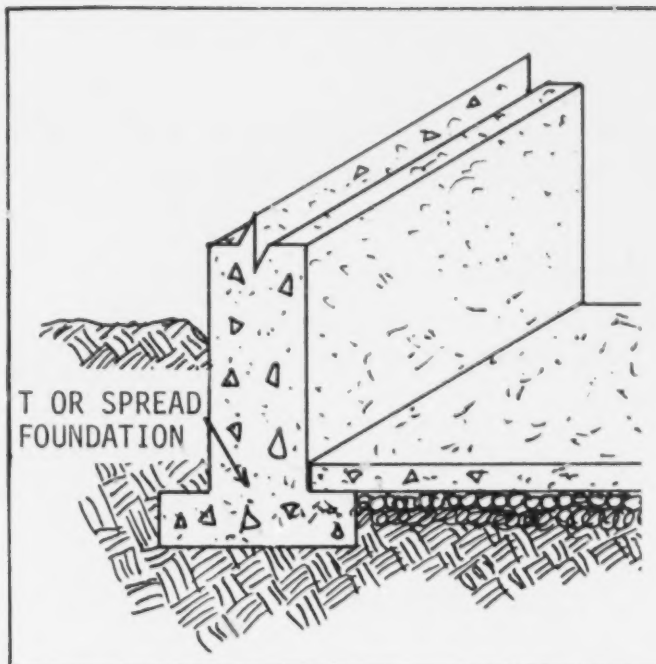
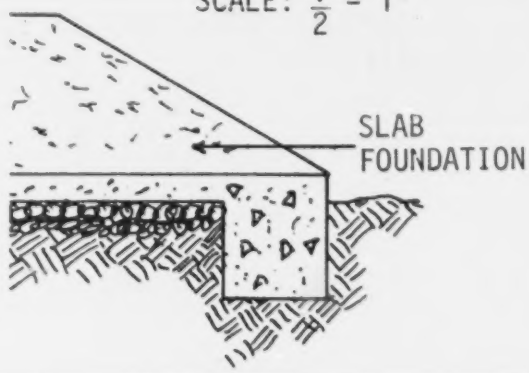


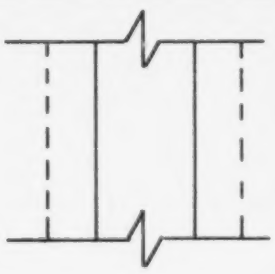
Fig. 79CD-3. Electrical Items



PICTORIAL VIEW

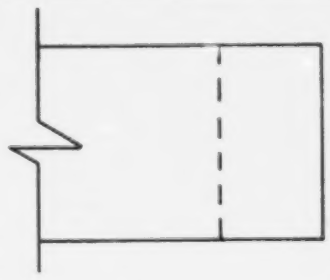
SCALE: $\frac{1}{2}$" = 1'

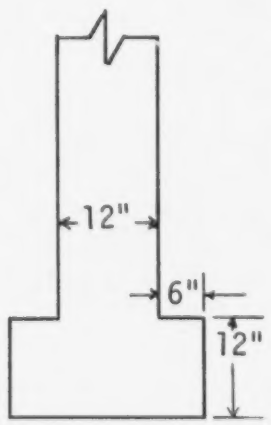




PLAN VIEW

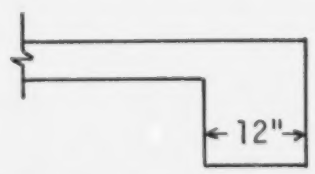
SCALE: $\frac{1}{2}$" = 1'





ELEVATION VIEW

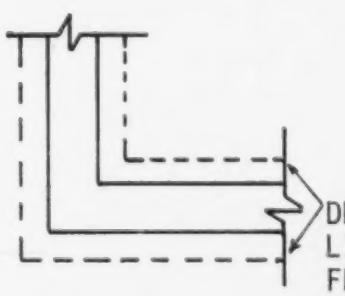
SCALE: $\frac{1}{2}$" = 1'



YOUR PLAN

PLAN VIEW

SCALE: $\frac{1}{4}$" = 1'



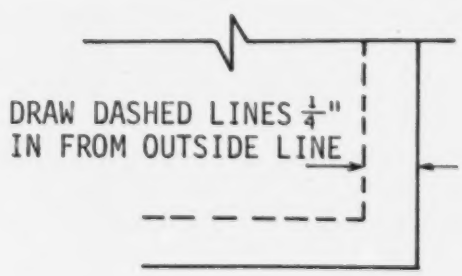


Fig. 79CD-1. T or Spread Foundation

Fig. 79CD-2. Slab Foundation

2. Locate and lay out the electrical outlets, switches, and lights on the tracing as shown in Fig. 79CD-4. Refer to Fig. 79CD-5 for the correct symbols.
3. Using a dashed line, show the electrical wiring that connects ceiling fixtures and switches.
4. If time permits, repeat Steps 1 through 3 for the bathroom and bedrooms.

Cleaning Up

5. Return all equipment and supplies, and store your drawings.

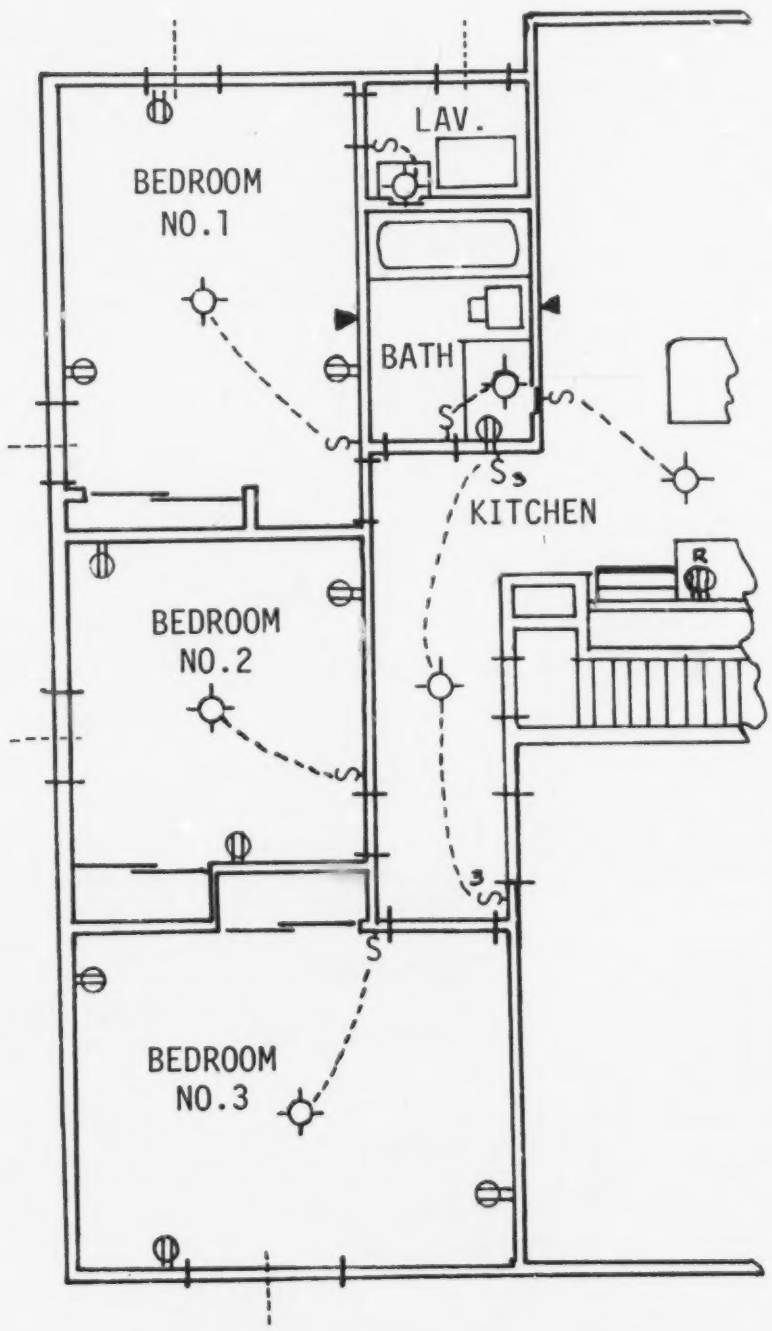


Fig. 79CD-4. Electrical Lines and Outlets

SWITCHES	
DESCRIPTION	SYMBOL
SINGLE POLE SWITCH	S
3 WAY SWITCH	S_3
WEATHERPROOF CIRCUIT BREAKER	S_{WCB}
WEATHERPROOF SWITCH	S_{WP}

CONVENIENCE OUTLETS	
DESCRIPTION	SYMBOL
DUPLEX CONVENIENCE OUTLET	
CONVENIENCE OUTLET OTHER THAN DUPLEX 1=SINGLE 3=TRIPLEX ,ETC.	$_{1,3}$
WEATHERPROOF CONVENIENCE OUTLET FOR EXTERIOR USE	$_{WP}$
RANGE OUTLET	$_{R}$
SWITCH AND CONVENIENCE OUTLET	$_{S}$
TV OUTLET	TV

GENERAL OUTLETS		
DESCRIPTION	CEILING	WALL
LIGHT OUTLET		
CLOCK OUTLET		C
FAN OUTLET	F	F

AUXILIARY OR LOW VOLTAGE SYSTEMS	
COMBINATION BELL BUZZER	
CHIME	CH
TELEPHONE	
AUTOMATIC FIRE ALARM DEVICE	FS

Fig. 79CD-5. Electrical Symbols and Conventions

ACTIVITY 79E

Preparing Working Drawings

Today you will begin developing elevations to show what your dream house will look like after it is constructed. When your set is complete, there will be four elevation drawings: one for each side of the house. All the exterior features of the house such as the windows, the doors, the exterior finish, and the roof, are to be shown on the elevation drawings.

Problem 1

Objective

Using your basic floor plan as a guide, develop a right side elevation of your dream house.

Equipment (Each student, both problems)
1 architect's scale

Supplies (Each student, both problems)
2 shts. grid paper, ruled ¼" x ¼"
1 2H pencil
1 8" piece masking tape

Preparing to Work

1. Get the architect's scale and supplies.
2. You will use your floor plan as a guide in drawing elevations. However, many kinds of elevations can be designed from one floor plan. See Fig. 79E-1.

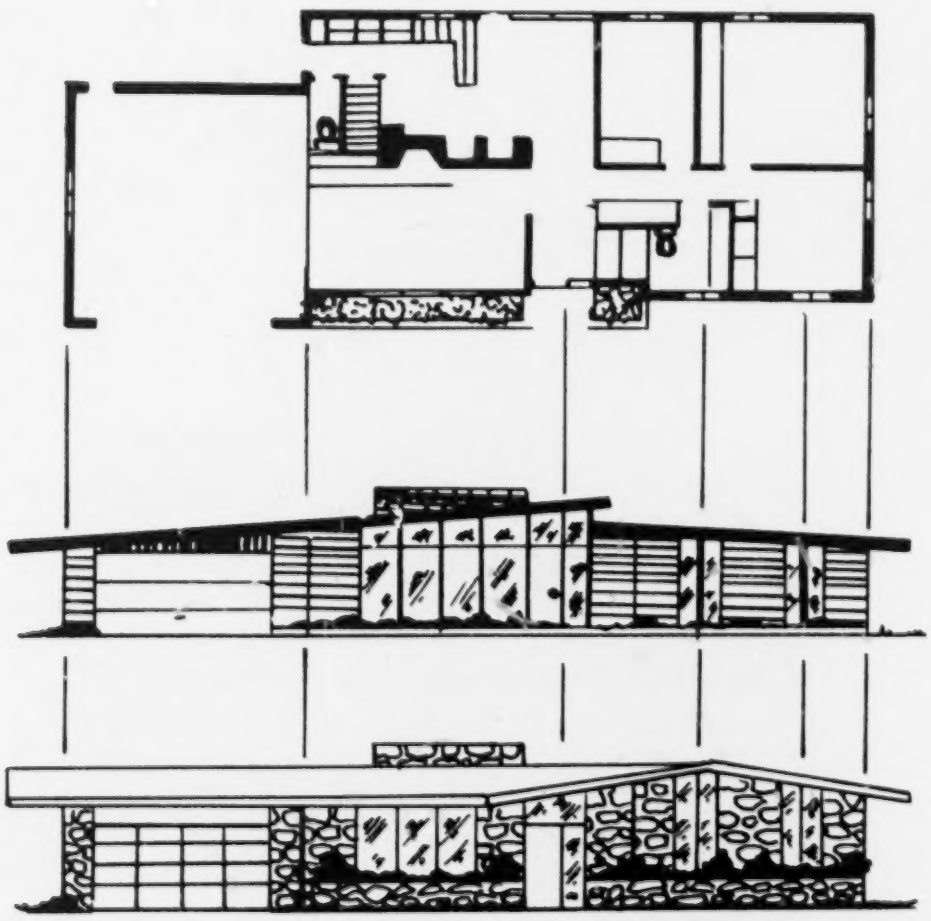


Fig. 79E-1. Two Different Elevation Styles Projected from One Floor Plan

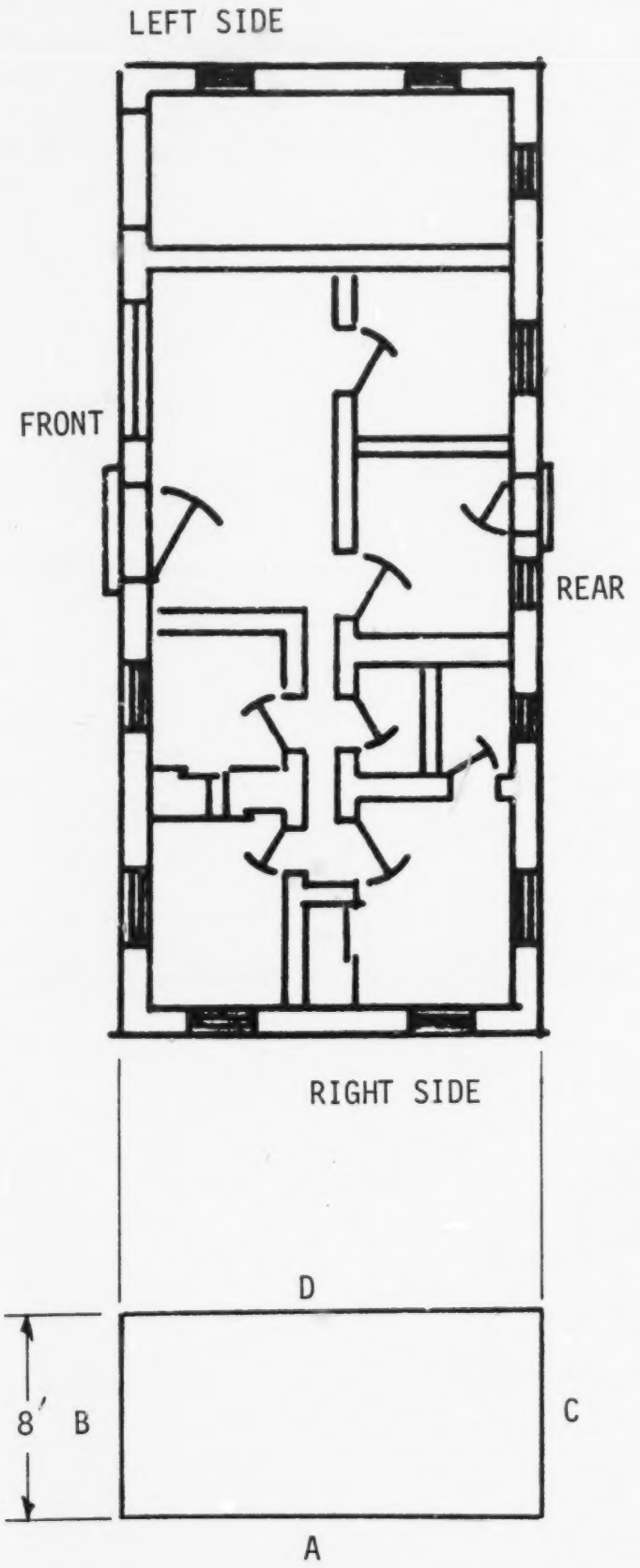


Fig. 79E-2. Floor Plan and Elevation

3. Tape your floor plan to the desk with the *front* of the house facing you. Tape grid paper beside the right side of the floor plan. See Fig. 79E-2.

Developing Elevation

4. Begin your right side elevation as shown in Fig. 79E-2. Put in the following lines:
   a. Finish floor line (A)
   b. Left edge of outside wall (B)
   c. Right edge of outside wall (C)
5. Next, draw a top line (D). Locate it 8′ (8 grid units) above line A. (In an actual house, line D would be the top of the framing piece called the "double plate.")
6. Find the exact middle of the top line (D) by counting grid units. Draw a center line (E) through this point as in Fig. 79E-3.

Developing Roof

7. Figure 79E-3 shows a gable-end roof with a 1:2 slope. Figure 79E-4 shows the same roof, and two others. Pick one of these roof slopes and draw it on your elevation, following Steps 8, 9, and 10.

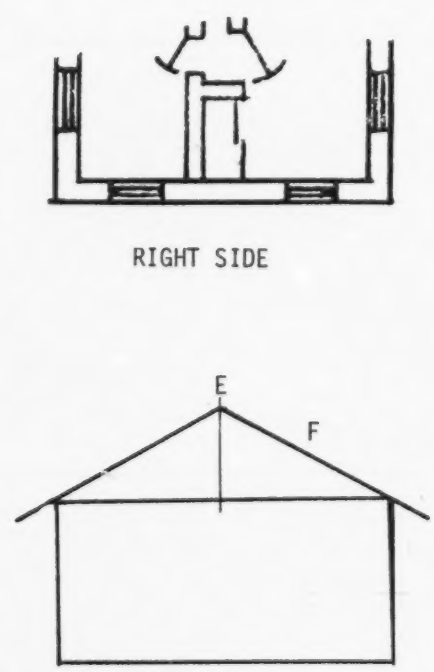


Fig. 79E-3. Drawing Gable End

a. $\frac{\text{rise}}{\text{run}} = \frac{1}{2}$ (1:2 slope)

b. $\frac{\text{rise}}{\text{run}} = \frac{1}{3}$ (1:3 slope)

c. $\frac{\text{rise}}{\text{run}} = \frac{1}{4}$ (1:4 slope)

8. Start at the left end of the top line. Follow Step 9a, 9b, and 9c, depending on the slope you chose.

9a. Count two grid units to the *right* and one grid unit *up*. Mark this point. Draw the left half of the roof as in Fig. 79E-4a.

9b. Count three grid units to the *right* and

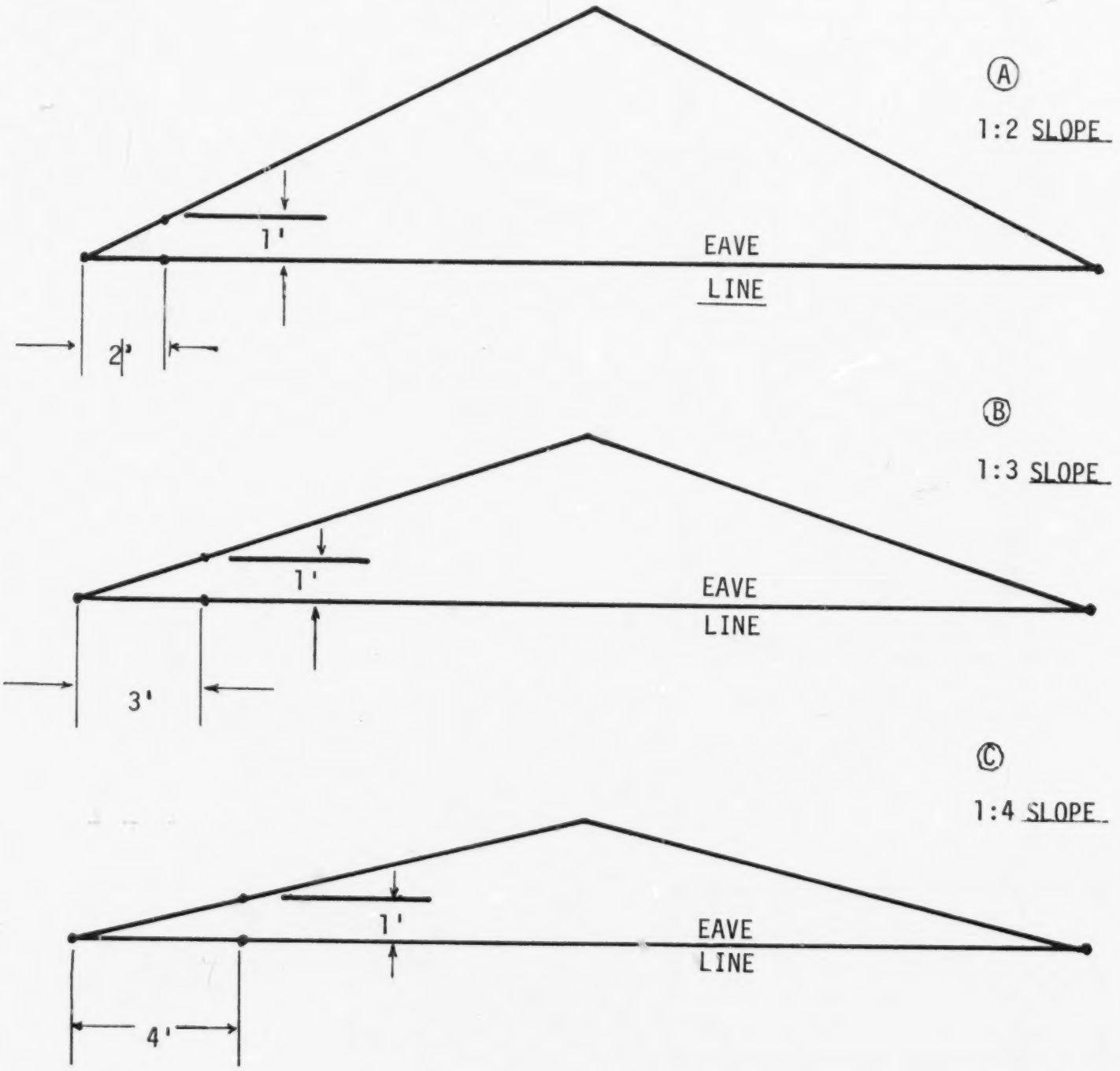


Fig. 79E-4. Roof Slopes

one grid unit *up*. Mark this point. Draw the left half of the roof as in Fig. 79E-4b.

9c. Count four grid units to the *right* and one grid unit *up*. Mark this point. Draw the left half of the roof as in Fig. 79E-4c.

10. Draw the right half of the roof in the same way.

11. Your left and right roof lines should cross at the center line. If they do not, correct your drawing.

12. Extend the roof lines (F) to form an overhang, as in Fig. 79E-3.

13. Add about 8″ of thickness for the roof ($\frac{3}{16}$″ in scale). See Fig. 79E-5.

14. Locate windows and doors from the floor plan as in Fig. 79E-6.

15. Show window and door heights as in Fig. 79E-6.

    a. Top measurements for all windows and doors are 6′8″ from floor line A.

    b. Window sill heights depend on whether privacy is wanted (as in a bathroom) and on personal taste.

16. Below this view print:

    RIGHT SIDE ELEVATION

    Also record your name.

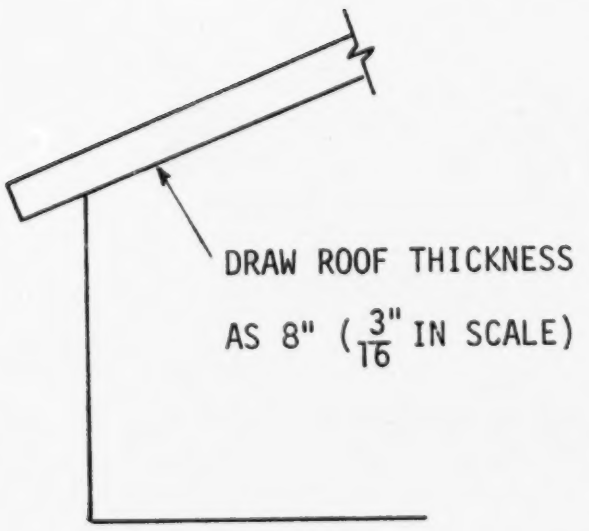


Fig. 79E-5. Roof Thickness

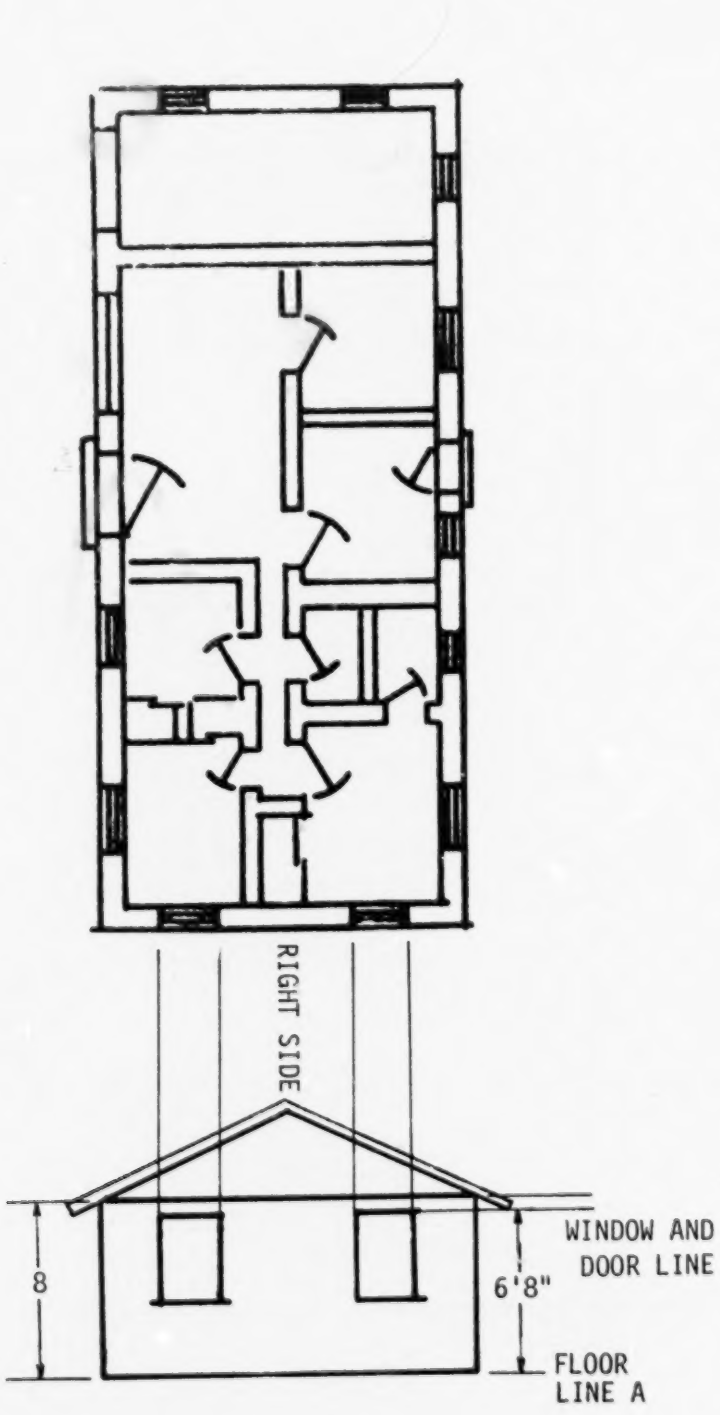


Fig. 79E-6. Window Heights

Problem 2

Objective

Using your basic floor plan as a guide, draw a front elevation of your dream house.

Developing Elevations

1. Remove the right side elevation drawings and tape another sheet of grid paper below the floor plan. See Fig. 79E-7.
2. Begin your front elevation as shown in Fig. 79E-7. Put in the following lines:
   a. Floor line (A)
   b. Left edge of outside wall (B)
   c. Right edge of outside wall (C)
   d. Top line (D)
   (The top line will be 8′ above line A.)

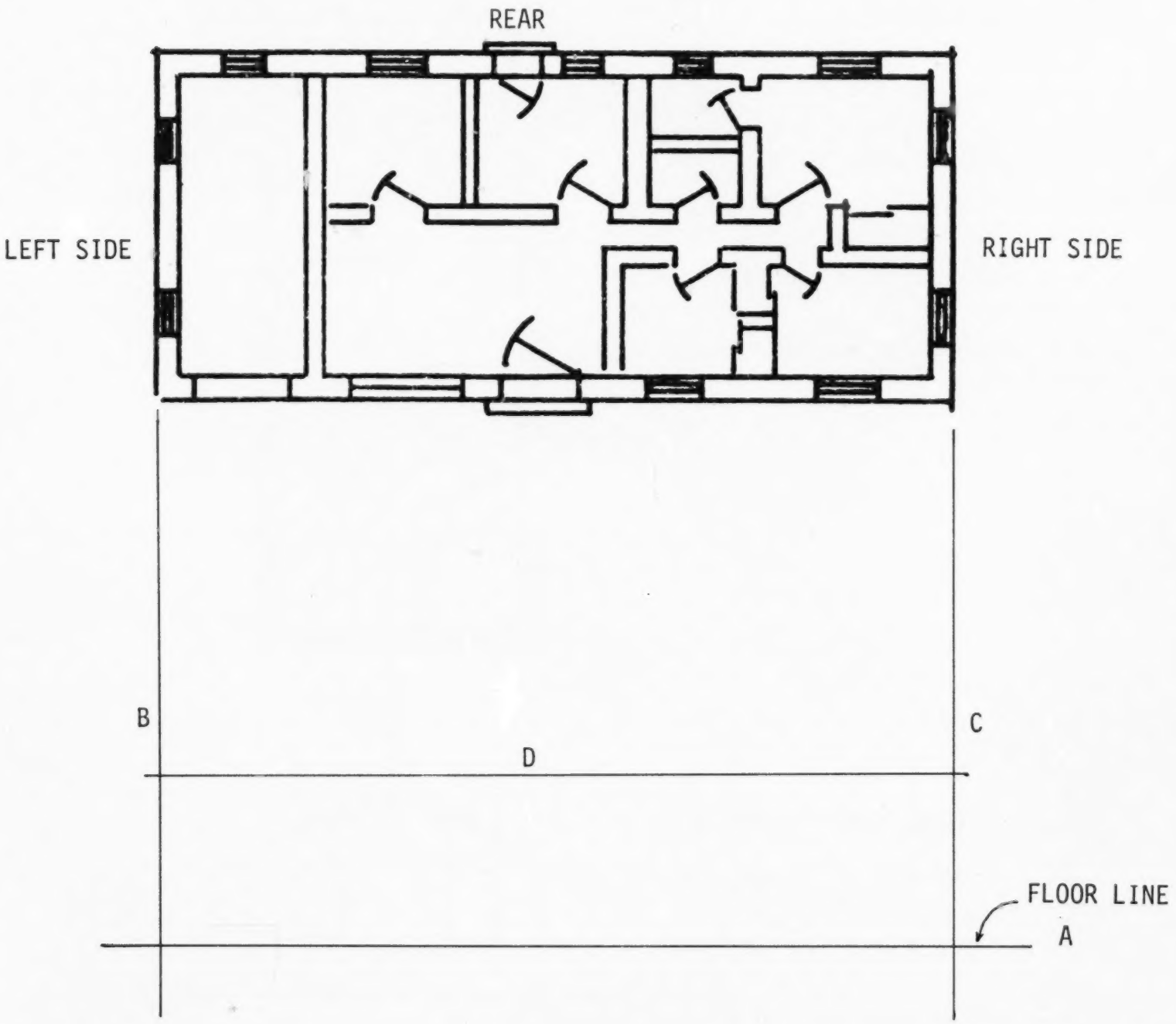


Fig. 79E-7. Starting Elevation

3. On your side elevation, find the height of the roof. Measure at the center line from line D to peak.

4. Transfer this measurement and draw the roof. Extend it to form the overhang as in Fig. 79E-8.

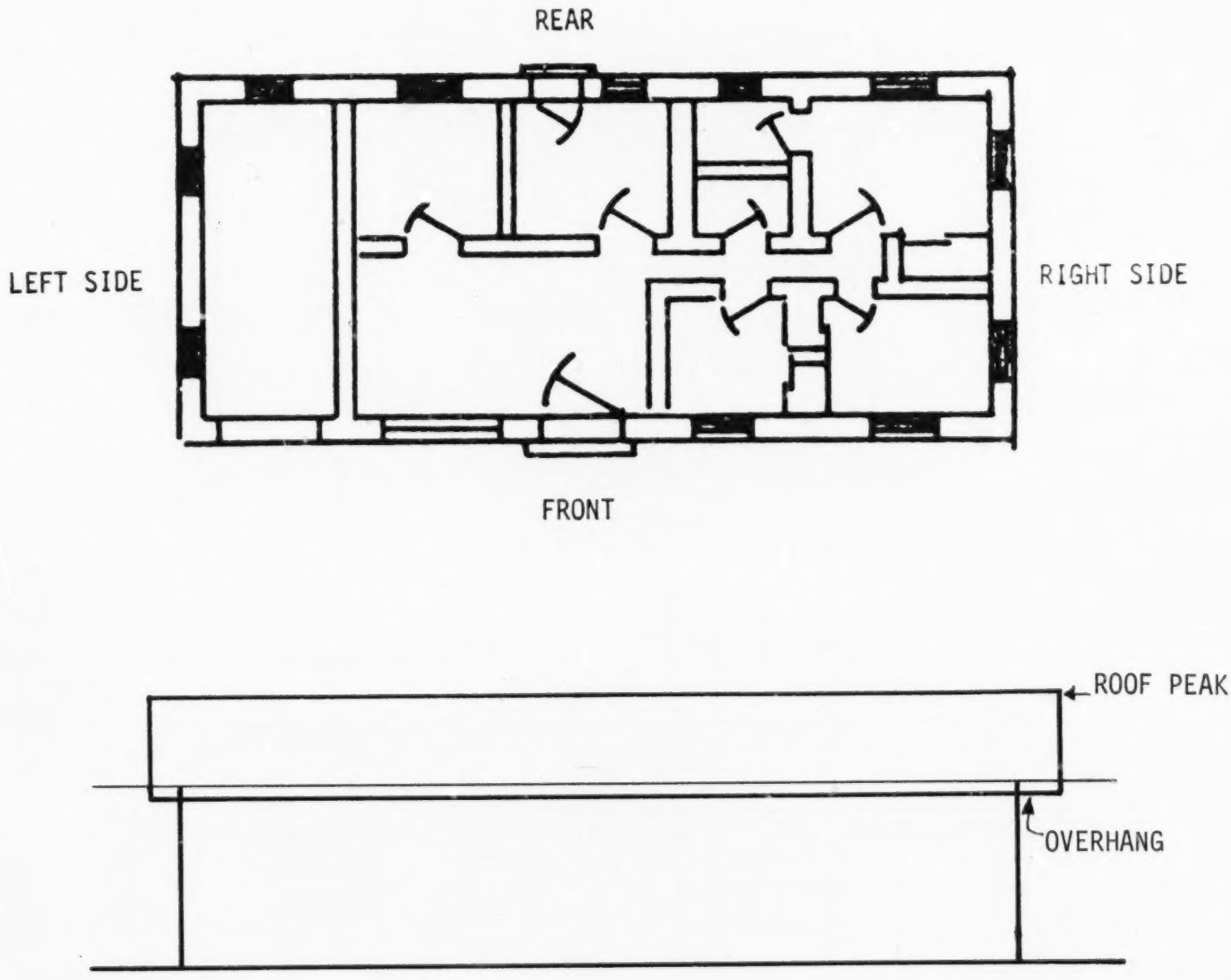


Fig. 79E-8. Drawing Roof Lines

5. Draw the thickness of the roof. See Fig. 79E-9.
6. Locate the windows and doors as in Problem 1. See Fig. 79E-9.
7. Show window and door heights as in Problem 1, Step 14. See Fig. 79E-9.

Cleaning Up

8. Return all equipment and supplies, and store drawings as directed.

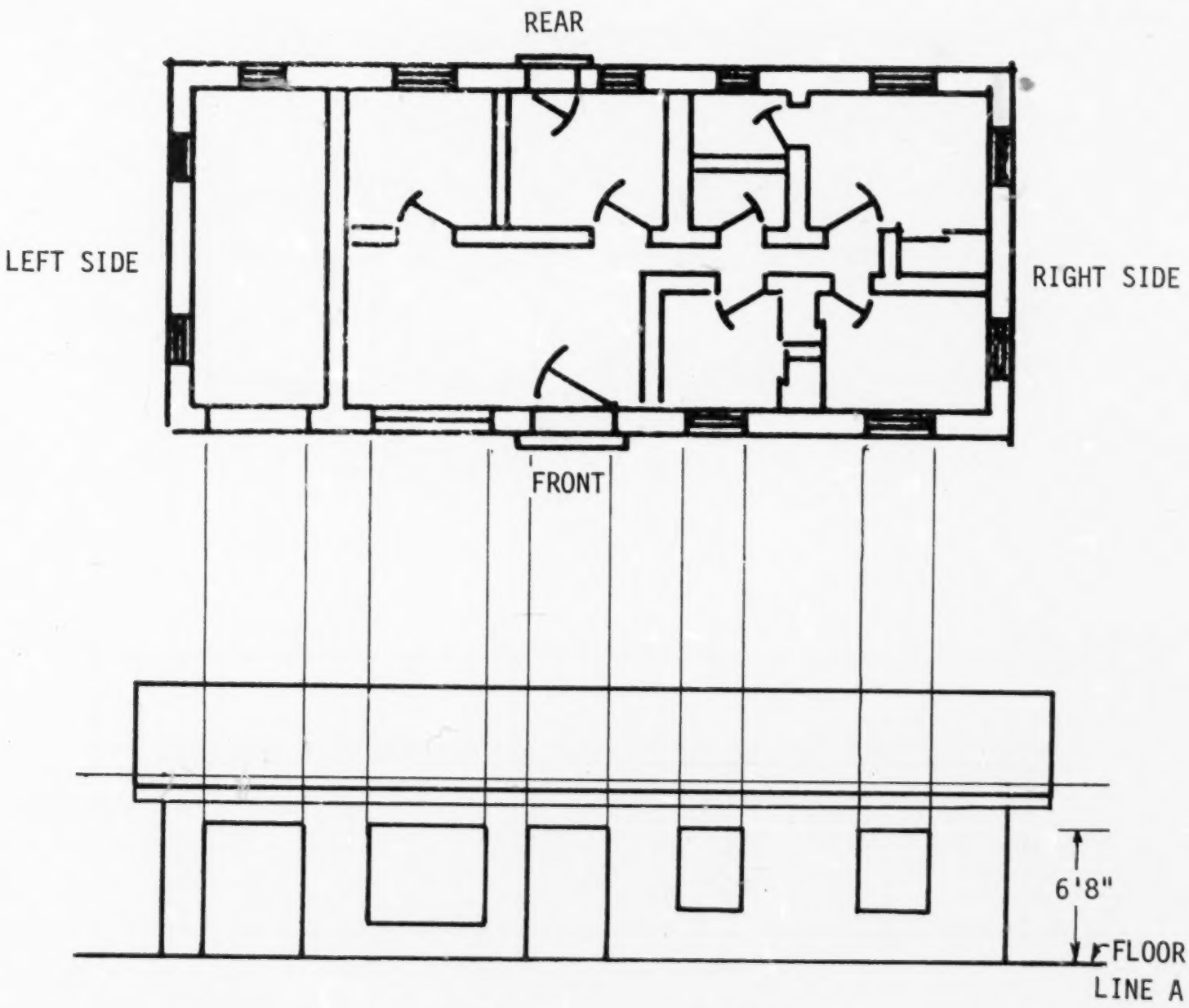


Fig. 79E-9. Locating Doors and Windows

ACTIVITY 79F

Preparing Working Drawings

Problem 1

Objective

Using a refined floor plan as a guide to drawing elevations, draw the left side elevation for the dream house.

Equipment (Each student, all problems)
1 architect's scale

Supplies (Each student, all problems)
1 ea. right side and front elevations
1 floor plan
1 2H pencil
1 8″ piece masking tape

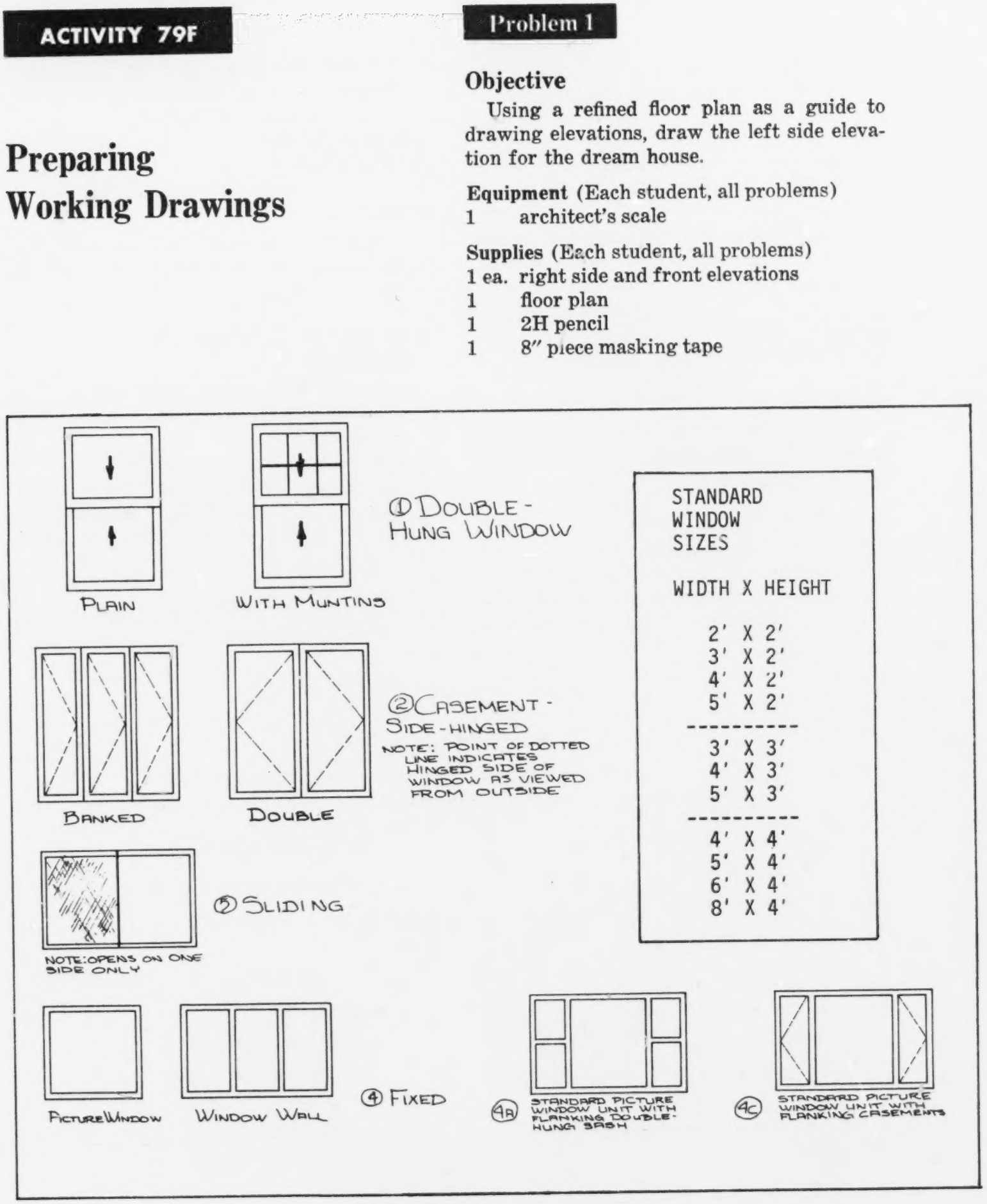


Fig. 79F-1. Window Design Styles

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Preparing to Work

1. Get the architect's scale and supplies.

Drawing Left Side Elevation

2. Follow the procedure you used in Activity 79E to draw the left side elevation of your dream house. It should look very much like the right side elevation, but the windows and doors may be in different places.

Problem 2

Objective

Using a refined floor plan as a guide to drawing elevations, draw the rear elevation for the dream house.

Rear Elevation

1. Following the procedure you used in Activity 79E, draw the rear elevation of your dream house. It should look very much like the front elevation, but the windows and doors may be in different places.

Problem 3

Objective

Using the completed elevation drawings, show window and door design styles and exterior materials.

Drawing Windows, Doors, and Materials

1. Choose window and door styles from Figs. 79F-1 and 79F-2. Add these on your drawings.
2. Choose the exterior materials for your dream house from Fig. 79F-3. Show each material on your drawing by copying the symbol or "convention" from the figure.

Cleaning Up

3. Return all equipment, supplies, and drawings to proper storage.

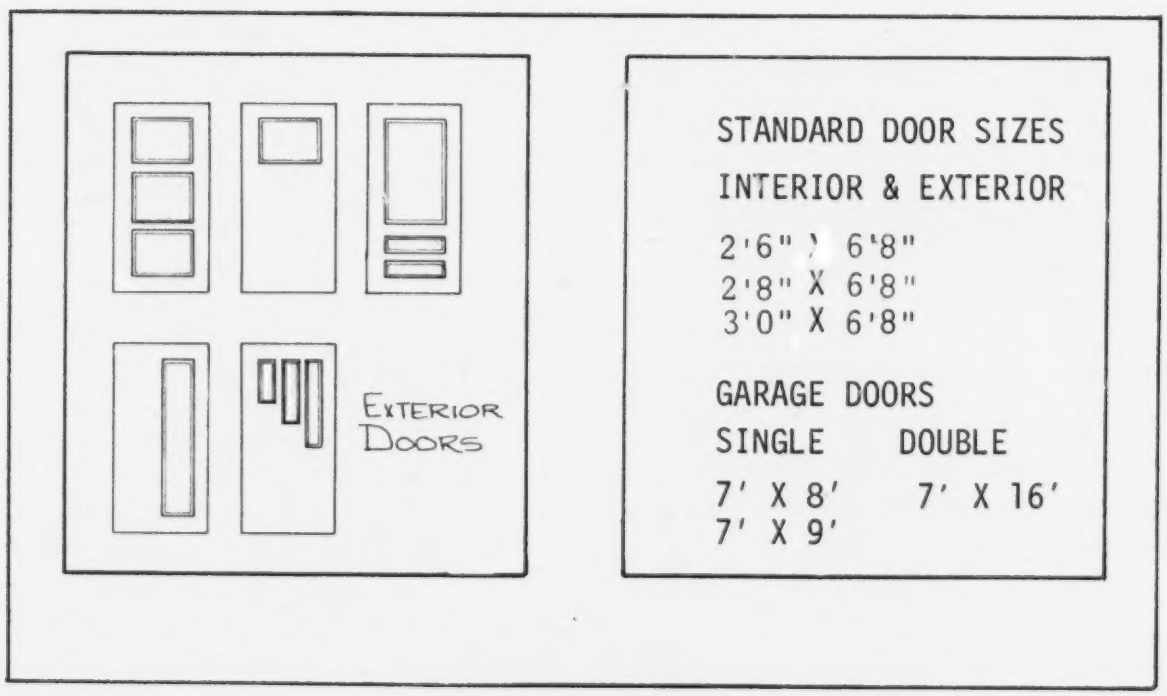

Fig. 79F-2. Door Design Styles

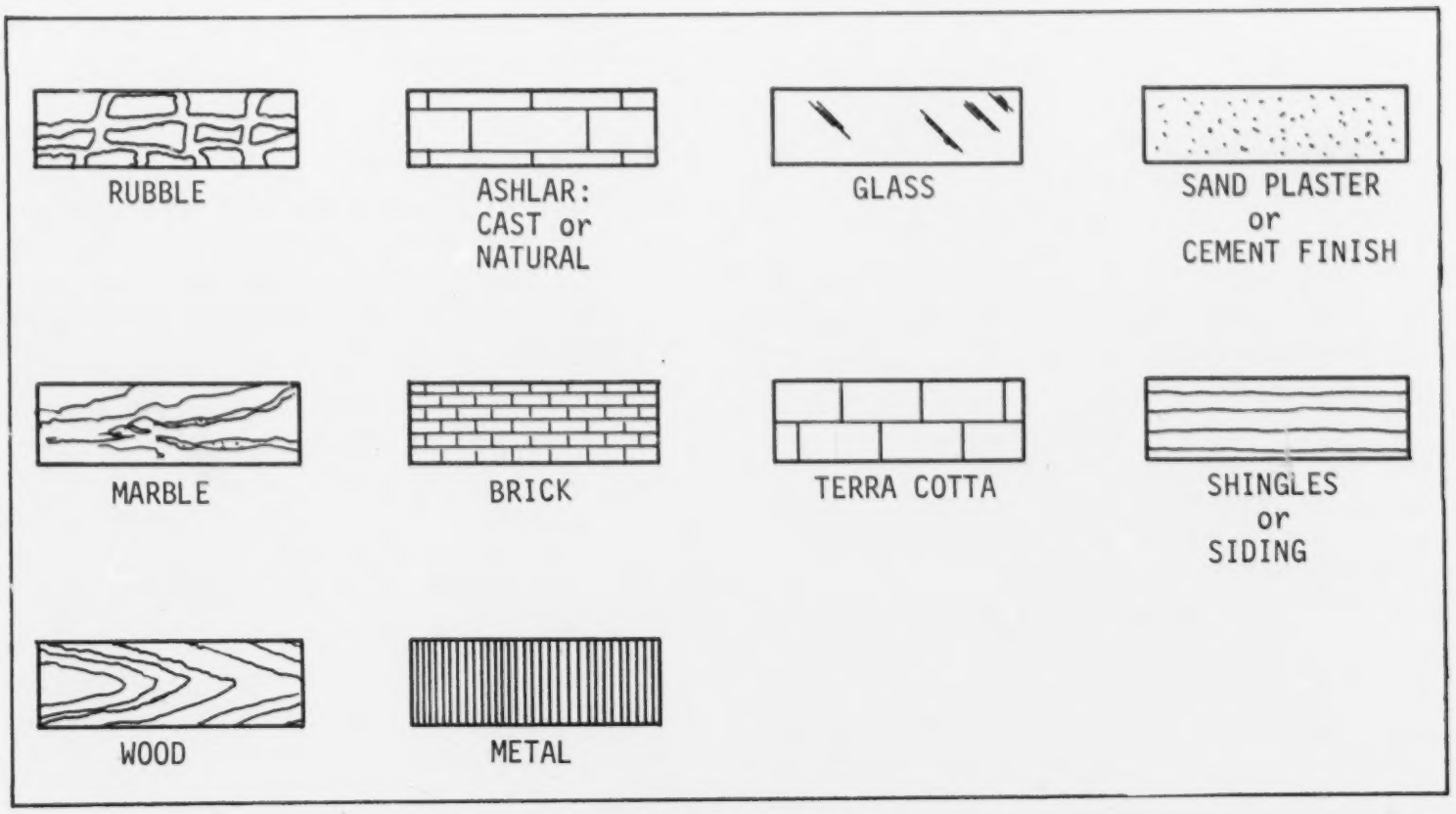

Fig. 79F-3. Material Symbols for Elevation Treatments

ACTIVITY 79G

Preparing Working Drawings

Problem

Objective

Using the scale $\frac{1}{8}'' = 1'$, draw a plot plan for your dream house.

Equipment (Class)
several pr. scissors
Equipment (Each student)
1 architect's scale
1 T-square, if unlined paper is used
Supplies (Each student)
1 sht. grid paper, ruled $\frac{1}{8}'' \times \frac{1}{8}''$
or unlined paper*
1 dream house floor plan
* See Steps 1 and 2 for size needed.

Preparing to Work

1. Find the lot size you chose in Activity 77, Problem 1, Chart 77-1 or 77-2. Locate the same lot dimensions in Chart 79G-1, and mark your lot (√).

$$\frac{9''}{\text{OLD LENGTH}} \times \frac{6''}{\text{OLD WIDTH}}$$

$$\frac{4\frac{1}{2}''}{\text{NEW LENGTH}} \times \frac{3''}{\text{NEW WIDTH}}$$

Fig. 79G-1. Dimensions for a 36" x 24" Floor Plan, Scaled $\frac{1}{4}'' = 1'$ and Rescaled $\frac{1}{8}'' = 1'$

2. From the chart, find out whether to cut your piece of paper from a sheet $12\frac{1}{2}''$ wide or from a sheet 25" wide. Then cut a piece the size you need, or a little larger.
3. The scale for your plot plan will be: $\frac{1}{8}'' = 1'$. This is not the scale size you have been using. Be sure that you know how to read your architect's scale for today's activity.

Finding New Size

4. You will be drawing your dream house on its lot, but the new house drawing will be smaller than the floor plan you have been working with. Find the new scaled size this way:
   a. On the floor plan, measure the length and width of your house to the nearest inch. It is:

      _____" x _____"
      old length old width

   b. On today's plot plan, your house will be drawn $\frac{1}{2}$ as long and $\frac{1}{2}$ as wide as it was before, so divide the length and width by 2:

      _____" x _____"
      new length new width

   c. Figure 79G-1 shows an example. Study it if you need to.

Completing Plot Plan

5. Decide where you want your house on the plot plan, and draw it to the new scale.
6. Add all attached areas (garage, porch, etc.).
7. Locate sidewalks, driveways, and all other masonry areas.
8. At the bottom right corner letter:

   PLOT PLAN
   SCALE: $\frac{1}{8}'' = 1'$

   Also record your name and class section.

Cleaning Up

9. Return all equipment and supplies, and store the drawings.

Chart 79G-1

Building Lot Sizes and Scaled Dimensions for the Scale 1/8″ = 1′

Lot Dimensions	Scaled Dimensions	
____ 75′ x 100′	9⅜″ x 12½″	Cut paper from 12½″ sheet.
____100′ x 100′	12½″ x 12½″	
____100′ x 150′	12½″ x 18¾″	
____100′ x 200′	12½″ x 25″	Cut paper from 25″ sheet.
____125′ x 200′	15⅝″ x 25″	
____200′ x 220′	25″ x 27½″	

ACTIVITY 80

Writing Specifications

Problem

Objective

1. Using a room material specification chart, select suitable materials for the walls, ceilings, and floors of a dream house.
2. Using elevations and a floor plan, window and door schedules, and catalogs, specify suitable sizes and styles of doors and windows for a dream house.

Equipment (Class)

2 manufacturer's catalogs
2 Montgomery Ward catalogs
2 Sears catalogs

Supplies (Each student)

1 set floor plan and elevations of dream house

Preparing to Work

1. Today you will use your drawings as a guide. You are to share catalogs as necessary.

Selecting Materials

2. Select the wall, floor, and ceiling materials for three rooms of your dream house. Show each choice on Chart 80-1 with a check mark in the proper column.

Marking Floor Plan

3. On your floor plan, print all the doors: A, B, C, etc. If two doors are to be exactly alike, give them the same letter.
4. Number all the windows. If several windows are to be exactly alike, give them all the same number.

Selecting Window or Door Styles

5. Using any of the catalogs, fill in either Chart 80-2 *or* Chart 80-3. Select the door or window styles that you want for your dream house.
6. The symbols you used on your floor plan to code each window and door go in the column titled "symbol." Take the rest of the information from catalog description.
7. If time permits, you may complete both charts.

Cleaning Up

8. Remove the charts, and store them with your working drawings.

Chart 80-2
Window Specifications Schedule

Code Symbol	Quantity	Width	Height	Material	Type	Screen? (Yes/No)	Unit Cost	Total Cost	Catalog Number	Manufacturer

Chart 80-1
Room Material Specification Schedule

	Floors										
Room	Concrete	Terrazzo	Ceramic tile	Stone	Hardwood	Vinyl	Linoleum	Asphalt	Cork	Carpeting	Other
Entry											
Living Room											
Kitchen											
Dining Room											
Family Room											
Bedroom 1											
Bedroom 2											
Bedroom 3											
Bedroom 4											
Bathroom 1											
Bathroom 2											
Utility Room											
Heater Room											
Basement											
Hall											
Other:											
Other:											

	Walls						
Room	Plaster	Plasterboard	Wood panel	Plastic laminate	Ceramic tile	Wallpaper	Other
Entry							
Living Room							
Kitchen							
Dining Room							
Family Room							
Bedroom 1							
Bedroom 2							
Bedroom 3							
Bedroom 4							
Bathroom 1							
Bathroom 2							
Utility Room							
Heater Room							
Basement							
Hall							
Other:							
Other:							

	Ceiling					
Room	Plaster	Plasterboard	Acoustical tile	Nonacoustical tile	Suspended panel	Other
Entry						
Living Room						
Kitchen						
Dining Room						
Family Room						
Bedroom 1						
Bedroom 2						
Bedroom 3						
Bedroom 4						
Bathroom 1						
Bathroom 2						
Utility Room						
Heater Room						
Basement						
Hall						
Other:						
Other:						

Chart 80-3
Door Specifications Schedule

Code Symbol	Quantity	Width	Height	Thickness	Material	Screen? Type (Yes/No)	Unit Cost	Total Cost	Catalog Number	Manufacturer

ACTIVITY 81

Financing and Contracting

Today you will fill out a contract for building your dream house, and you will figure a part of the financing cost.

Problem 1

Objective

Using a blank contract form, complete an agreement to build your dream house.

Writing a Contract

Chart 81-1 is a contract agreement. Follow the directions here. They are numbered to match the numbered blanks on the contract form.

1. Write today's date.
2. Write the name of the present month.
3. Write the present year.
4. Write the name of your contractor.
5. Write your name.
6. Write the title, "Dream House."
7. Write your name.
8. Write the date of the 4th school day after today.
9. Write the date of the 20th school day after today.
10. Write the cost of the house in words. (Refer to Activity 79A, Problem 2, Chart 79A-1.)
11. Write the cost of the house as a numeral.
12. Sign your name as owner.
13. Have another student sign as contractor.

Problem 2

Objective

Using the cost estimate for your dream house, figure the first month's interest payment on the loan.

Computing Interest

1. Chart 81-1, Item 11, shows the price of the dream house. Copy it onto Chart 81-2.
2. Enter the amount of cash you have ready to pay. (Choose some amount between $1,000 and $5,000.)
3. Subtract to find the amount you must borrow.
4. You will be charged an interest rate of 8% on a mortgage loan. To figure the amount of interest in your first monthly payment, first multiply the mortgage principal (Item 3) by a .08 (the interest rate).
5. Then divide by 12 (because one month is $\frac{1}{12}$th of a year). Enter this figure on line 5.

Example:

Price of dream house	$25,000.00
Cash for down payment	−$ 5,000.00
Amount of mortgage loan	$20,000.00
Interest rate	× .08
Interest based on 1 year	$ 1,600.00
First interest payment ($\frac{1}{12}$ of $1,600)	$ 133.33

Chart 81-2
Work Outline for Computing Interest

1. Price of dream house:	$_____
2. Cash for down payment:	$−_____
3. Amount of mortgage loan:	$_____
Interest rate:	× .08
4. Interest based on one year:	$_____
5. First interest payment:	$_____

Chart 81-1

Agreement Between Contractor and Owner for Building Dream House

This agreement is made on the (1)_____ day of (2)_____ in the year nineteen hundred and (3)_____ by and between (4)_____, hereinafter called the Contractor, and (5)_____, hereinafter called the Owner.

This agreement calls for the erection of (6)_____ by the Contractor for the owner. Now, therefore, the Contractor and the Owner, for the considerations hereinafter named, agree as follows:

ARTICLE 1. THE WORK TO BE DONE AND THE DOCUMENTS FORMING THE CONTRACTS

The contractor agrees to provide all the labor and materials, and to make all the necessary arrangements for the proper construction and completion of the work shown and described on drawings bearing the title Dream House for (7)_____ and in Specifications bearing the same title.

ARTICLE 2. TIME OF COMPLETION

The work to be performed under this Contract shall be commenced (8)_____ and shall be substantially completed (9)_____.

ARTICLE 3. CHANGES IN THE WORK

The Owner and Contractor agree that any changes in the work must be by written agreement between Owner, Contractor, and Architect.

ARTICLE 4. THE CONTRACTOR'S DUTIES AND STATUS

The Contractor will erect the house with the ablest of skill and judgment, and will cooperate with the Architect in the best interests of the Owner. The Contractor will also use efficient business administration and superintendence to insure the Owner that he is erecting the said building in a sound and economical manner.

ARTICLE 5. FEE FOR SERVICES

In consideration of the performance of the Contract, the Owner agrees to pay the Contractor, in current funds as compensation for his services hereunder, (10)_____ dollars (11) ($_____) which shall be paid as follows: One quarter the amount when the basement and subfloor have been erected; one quarter the amount when the building is enclosed; one quarter the amount when the utilities have been installed, and the last quarter of the amount when the building is completed and ready for occupancy.

_____

Signature of owner

_____

Signature of contractor

ACTIVITY 82

Building the Substructure

For today's activity you are to assume that your dream house is built on a slab foundation.

Problem

Objective

Using a grid paper floor plan and a piece of fiberboard, glue one to the other.

Equipment (Per class)
5 backsaws *or* equivalent
10 pr. scissors

Supplies (Each student)
1 floor plan, on grid paper

Supplies (Per class)
5 btls. rubber cement *or* white glue
5 shts. abrasive paper
4 shts. 4′ x 8′ hardboard

Safety Precaution

Care should be taken in the safe use of the backsaw or sabre saw, whichever is used.

Preparing to Work

1. Get your dream house floor plan, a piece of hardboard to use for a slab foundation, and scissors.

Building the Foundation

2. Use scissors to cut the floor plan from grid paper. Be sure to cut along the *outside* wall line of the floor plan as shown in Fig. 82-1. (Omit Step 2 if directed to do so by your teacher.)
3. Cement the floor plan to the foundation material before or after cutting. See Fig. 82-2.
4. Using a backsaw or similar tool, saw the foundation slab along the *outside* wall line of the floor plan. See Fig. 82-3.

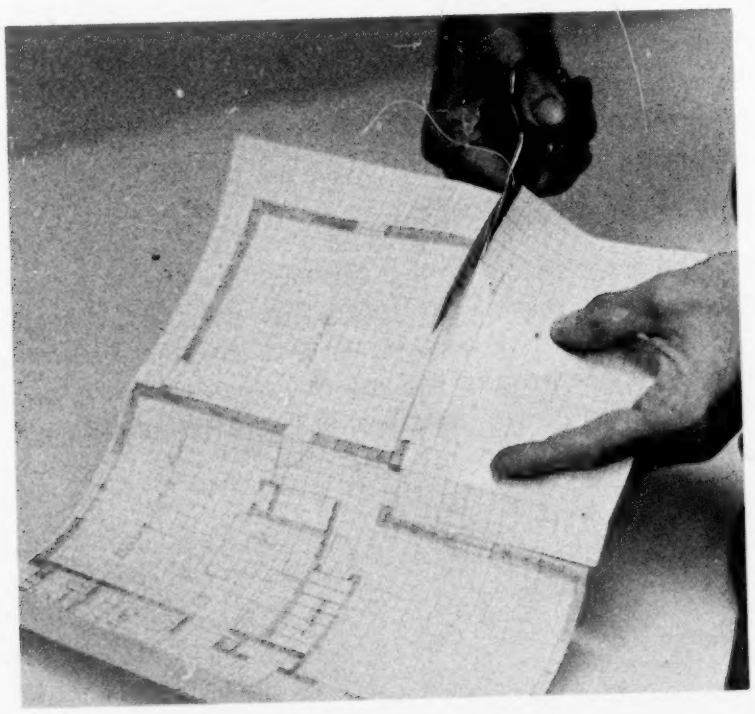

Fig. 82-1. Cutting Out Floor Plan

5. Write your name on the bottom of the slab. Then return it to storage.

Cleaning Up

6. Return all equipment and supplies, and clean up the work area.

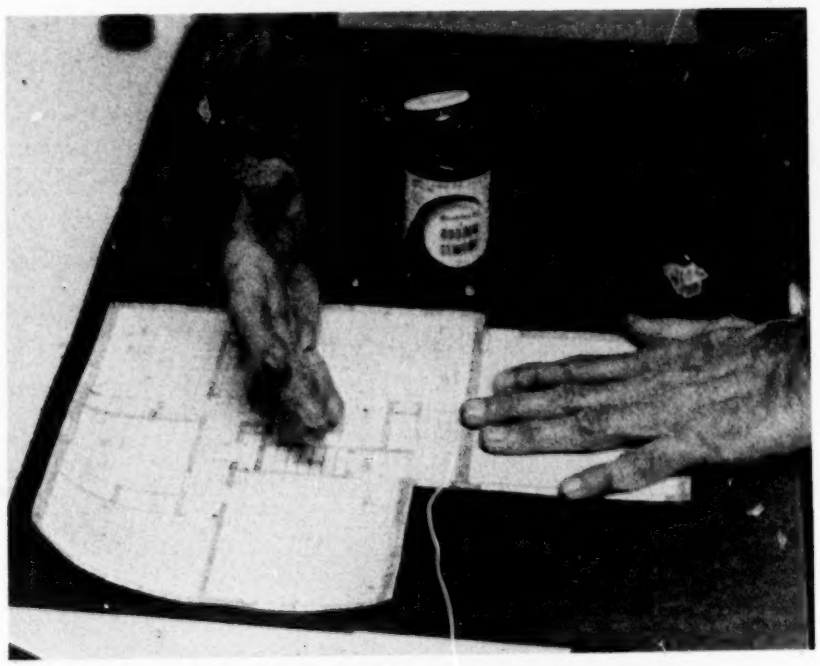

Fig. 82-2. Cementing Floor Plan to Site Board

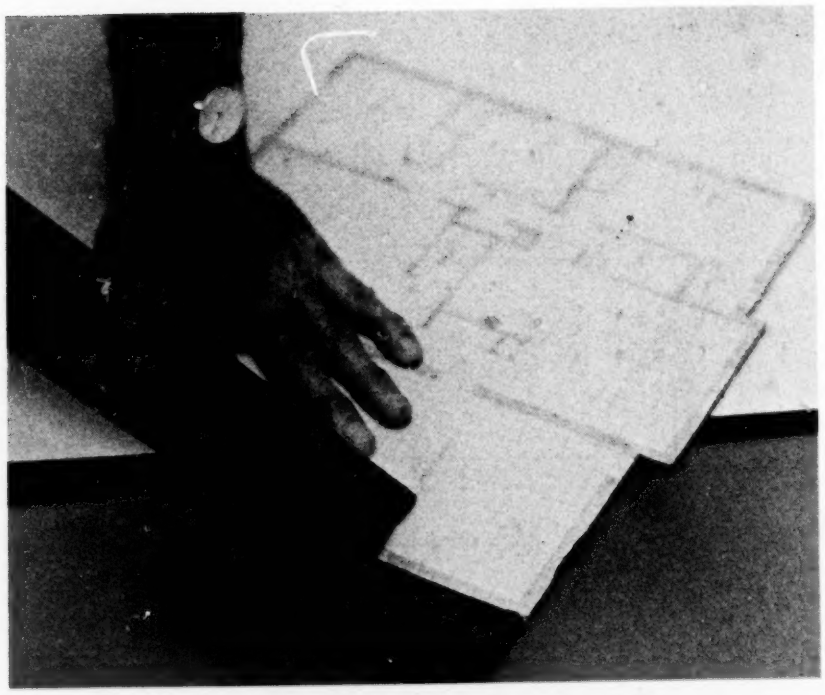

Fig. 82-3. Sawing Out Floor Plan

ACTIVITY 83A

Building Walls

Today you will lay out and cut the exterior walls of your model dream house.

Problem

Objective

Using a demonstrated procedure and proper tools:

a. Lay out and cut exterior walls to length.

b Lay out the width and height of doors and windows.

Equipment (Each class)

25 Xacto® *or* utility knives

5 try squares

Supplies (Each student)

4 pcs. ¼" x 2" x 13" (or longer) wall material (urethane foam)

1 slab foundation, from Activity 82

1 set elevation plans

Safety Precaution

Care must be taken in handling and storing the cutting tools.

Preparing to Work

1. Get your equipment and supplies. Share as necessary.

Laying Out Exterior Walls

2. Check one end of the ¼" x 2" wall material for squareness. Trim to square if necessary using a knife.
3. Place the squared material along one exterior wall of the floor plan and mark it to length. See Figs. 83A-1 and 83A-2.

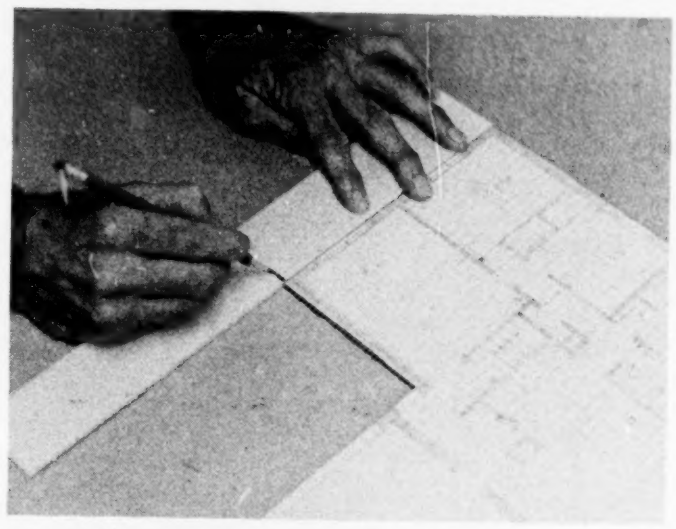

Fig. 83A-1. Marking Wall to Length

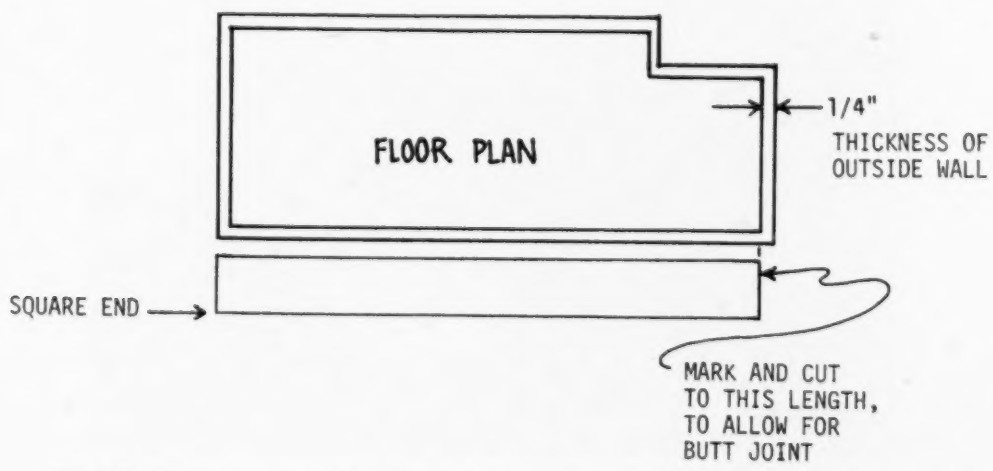

Fig. 83A-2. Pieces Are Cut ¼" Short to Allow for Butt Joints at Corners

Cutting Out Walls

4. Remember to mark one end to the *inside* wall to allow for a butt joint as shown in Fig. 83A-2.

Cutting to Length

5. Cut the wall material squarely to proper length. See Fig. 83A-3.
6. Repeat Steps 2-5 for each exterior wall section, making proper allowance for butt joints.

Laying Out Wall Openings

7. Locate and mark window and door openings on each wall section, as shown in Fig. 83A-4. Mark widths of openings carefully.
8. Check the proper elevation drawing to determine window and door opening heights, and draw them in.

Cleaning Up

9. Return equipment and supplies to proper storage, and clean up the work area.

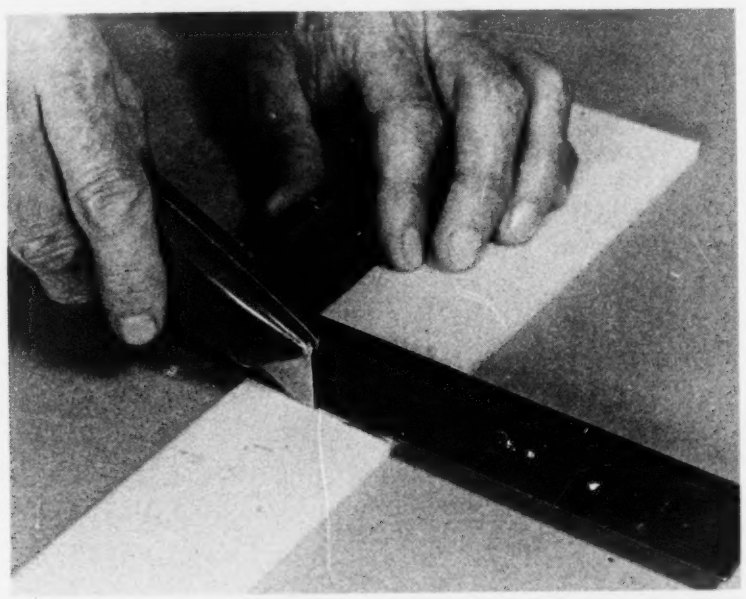

Fig. 83A-3. Cutting Square End

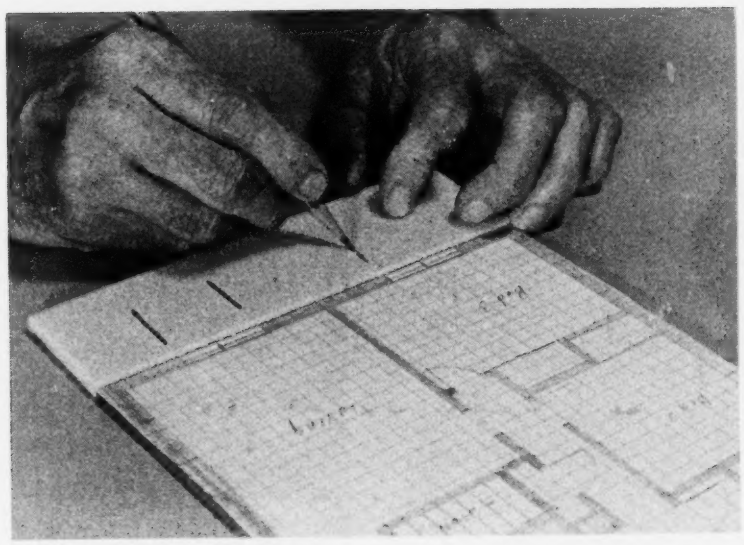

Fig. 83A-4. Locating a Door Opening

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ACTIVITY 83B

Building Walls

Today you will cut out the doors and windows of your model dream house, and erect the exterior walls.

Problem

Objective

Using a demonstrated procedure and proper tools, cut out the doors and windows and erect the exterior walls.

Equipment (Each class)
25 Xacto® *or* utility knives
5 try squares
15 window and door guides

Supplies (Each class)
5 btls. white glue
5 shts. extra fine (8/0) abrasive paper
300 straight pins

Supplies (Each student)
1 set exterior walls for dream house
1 slab foundation for dream house
1 set elevations

Safety Precaution

Care must be taken in handling and storing cutting tools.

Preparing to Work

1. Get your equipment and supplies. Share tools as necessary.

Erecting Exterior Walls

2. Using a window and door cutting guide, mark and cut out the window and door openings. See Fig. 83B-1.
3. Assemble the exterior wall sections in place, using glue and straight pins. See Fig. 83B-2.
4. Remove the pins after 10 to 15 minutes, before the glue is completely dry. (If you wait too long, the wall material may tear.)

Cleaning Up

5. Store your model. Return all equipment and supplies. Clean the work area.

Fig. 83B-1. Using Window and Door Guide

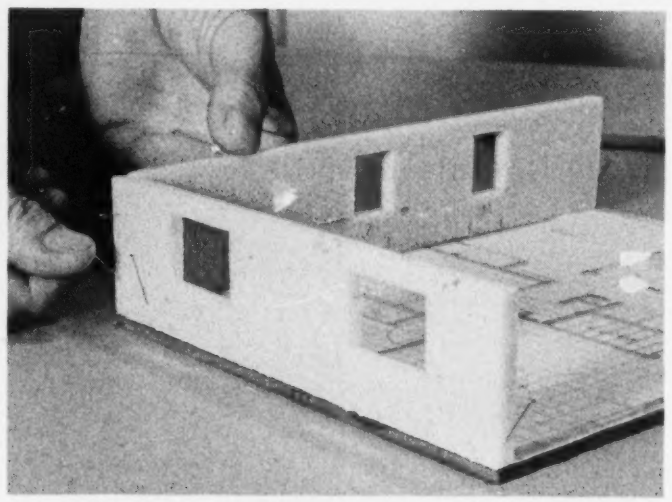

Fig. 83B-2. Holding Walls Together with Straight Pins

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ACTIVITY 84A, B, C

Building Floors and Ceilings

Today and during the next two assignments you will lay out, cut, and erect the interior walls of your dream house.

Problem

Objective

Using the materials and tools as demonstrated, lay out, cut, and erect the interior walls.

Equipment (Each class)
10 try squares
15 door and window cutting guides

Supplies (Each class)
300 straight pins
5 btls. white glue
5 shts. extra fine (8/0) abrasive paper
Equipment (Each student)
1 Xacto® *or* utility knife
Supplies (Each student)
4 pcs. ¼" x 2" x 13" interior wall material
1 floor plan tracing
1 slab foundation with exterior walls

Preparing to Work

1. Get your equipment and supplies. Share tools as necessary.

Laying Out Interior Walls

2. Check one end of the ¼" x 2" wall material for squareness. Trim to square if necessary using a utility knife.
3. Place the squared material along one interior wall of the floor plan. Trace and mark to length. See Fig. 84ABC-1.
4. Cut squarely to the proper length.
5. Sand lightly if needed for proper fit.
6. Repeat Steps 2-5 for each interior wall to be made.

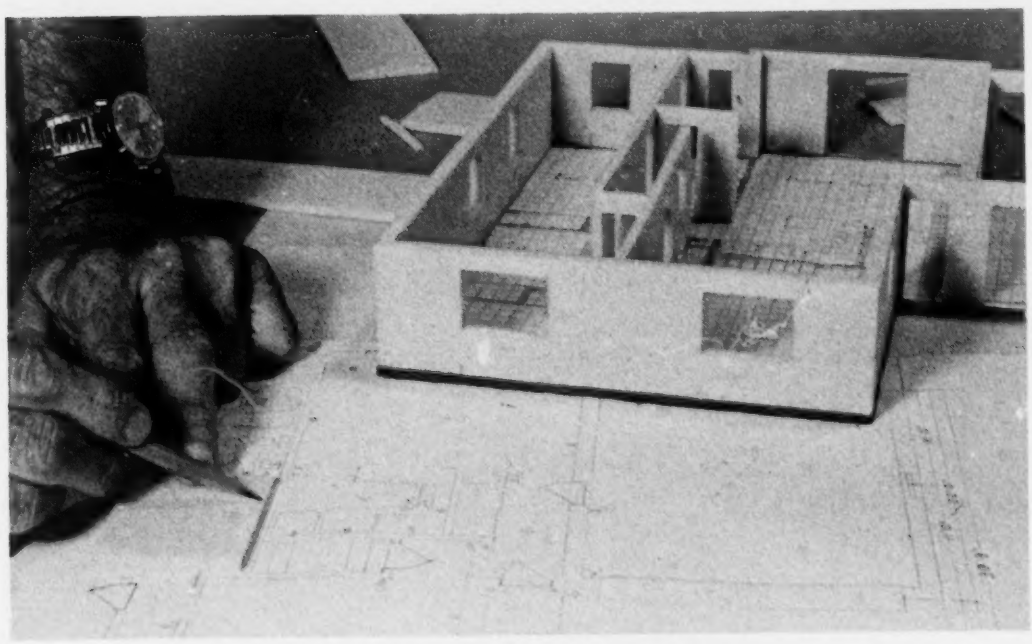


Fig. 84ABC-1. Laying Out an Interior Wall

Cutting Doors

7. Referring to the floor plan tracing, locate and mark the door openings on each interior wall.
8. Using the window and door cutting guide, mark and cut all interior door openings.

Erecting Interior Walls

9. Assemble the interior walls in place using glue and straight pins. See Fig. 84ABC-2.
10. Remove all pins before the glue is completely dry to prevent tearing the building material.

Cleaning Up

11. Return all equipment, supplies, and drawings to proper storage, and clean up the work area.

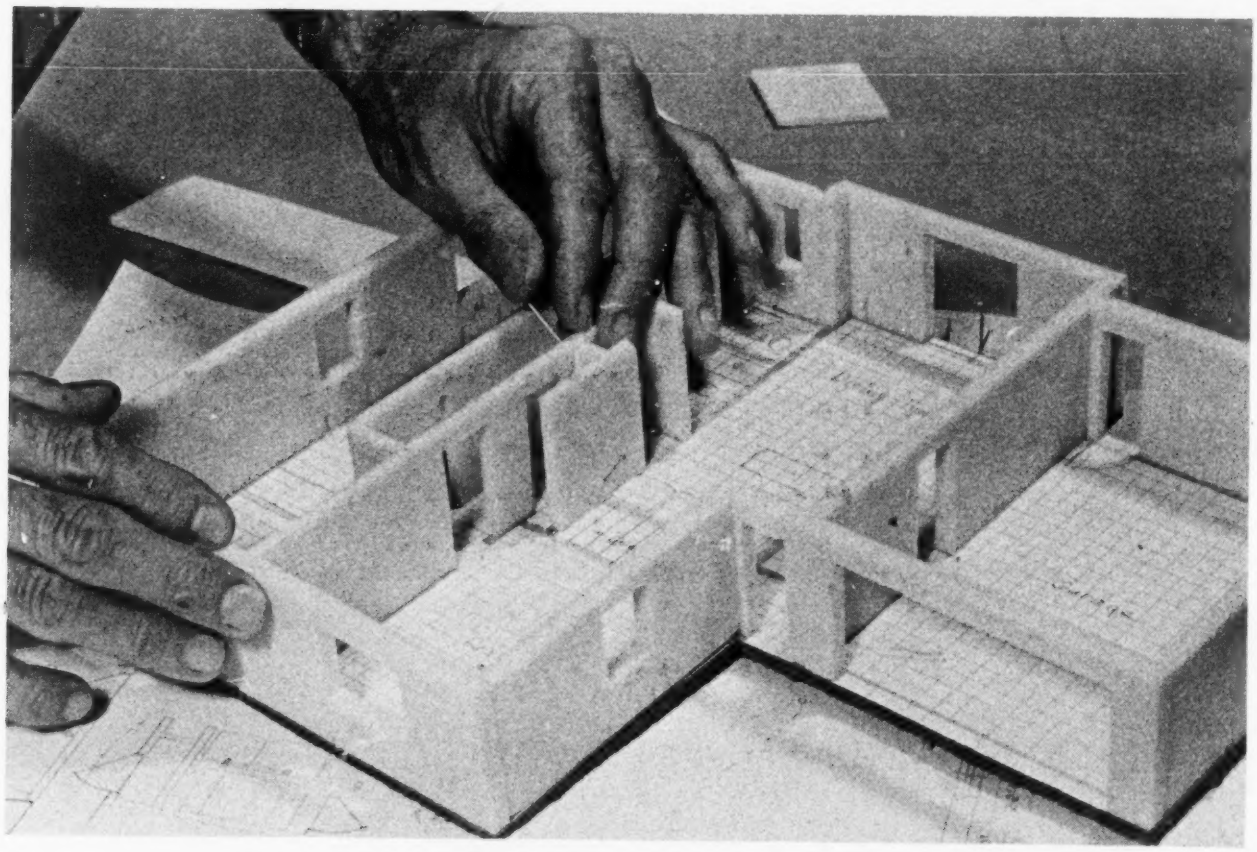


Fig. 84ABC-2. Assembling the Walls

ACTIVITY 85A

Building Roofs

Problem

Objective

Using dream house plans, equipment and supplies, lay out and cut roof trusses and roof sheathing for the dream house.

Equipment (Per class)
- 5 T-bevels
- 5 framing squares
- 5 try squares
- 30 Xacto® *or* utility knives

Supplies (Per class)
- 250 straight pins
- 5 shts. extra fine abrasive paper (8/0)

Supplies (Per student)
- 2 pcs. ¼″ x 2″ x 8″ (approx.) material for gable ends
- 2 pcs. ¼″ x 12″ x 18″ (approx.) material for roof
- 1 set elevations
- 1 incomplete model house
- 1 pc. 3″ x 10″ posterboard

Preparing to Work

1. Get your equipment and supplies. Share tools as necessary.

Building Roofs

2. Your elevation drawings show the size and shape of the trusses that will support your roof. See Fig. 85A-1.
3. Transfer these measurements to a piece of posterboard, and cut out a template (or pattern) for a roof truss.
4. Trace around the template onto construction material. Cut trusses and pin them to the exterior and bearing walls. See Fig. 85A-2.

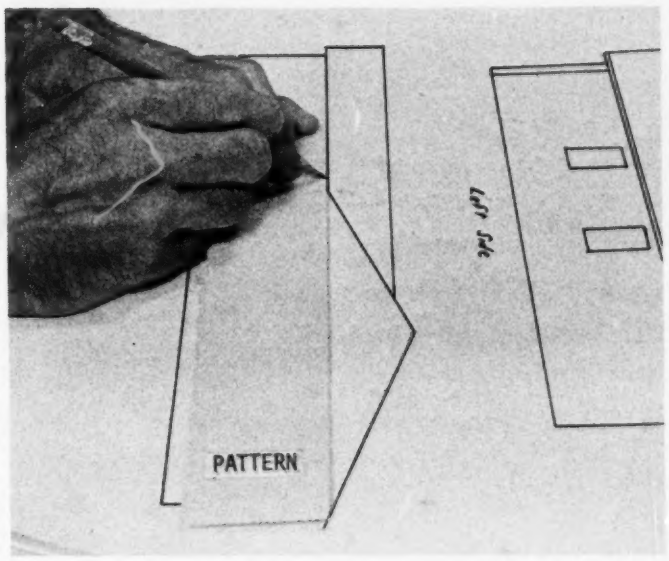


Fig. 85A-1. Transferring Roof Measurements

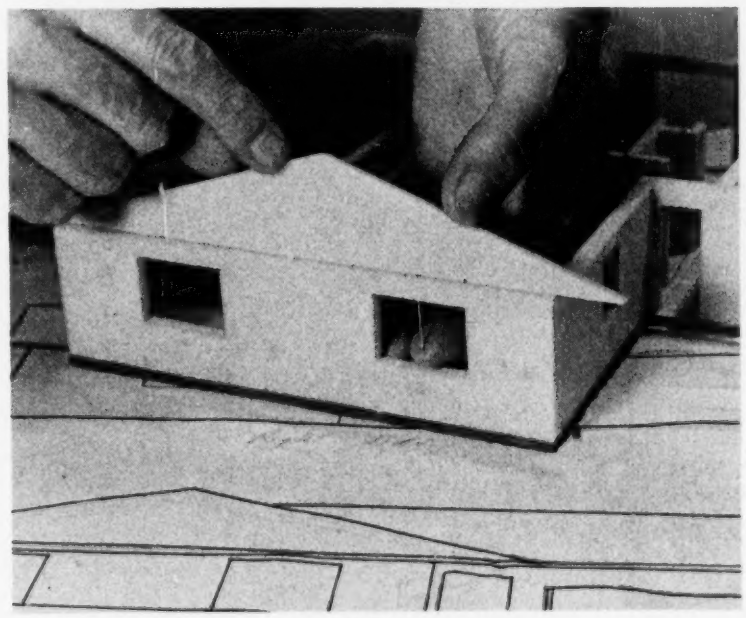


Fig. 85A-2. Locating and Pinning Trusses

5. Lay out the roof pieces, being sure to allow for overhang and ridge angle. See Fig. 85A-3. Then cut the pieces.
6. Sand the ridge angle as shown in Fig. 85A-4 (as your teacher demonstrated).
7. Lay the roof in place to check for fit at the ridge and overhang. See Fig. 85A-5.

Cleaning Up

8. Return all equipment and supplies. Store your model house and drawings. Clean up the work area.

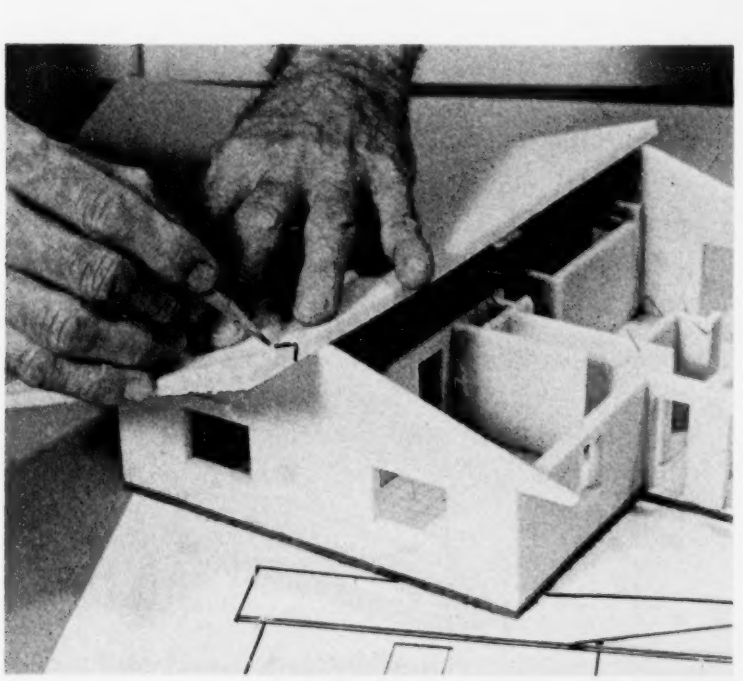


Fig. 85A-3. Measuring Roof Piece for Overhang and Roof Angle

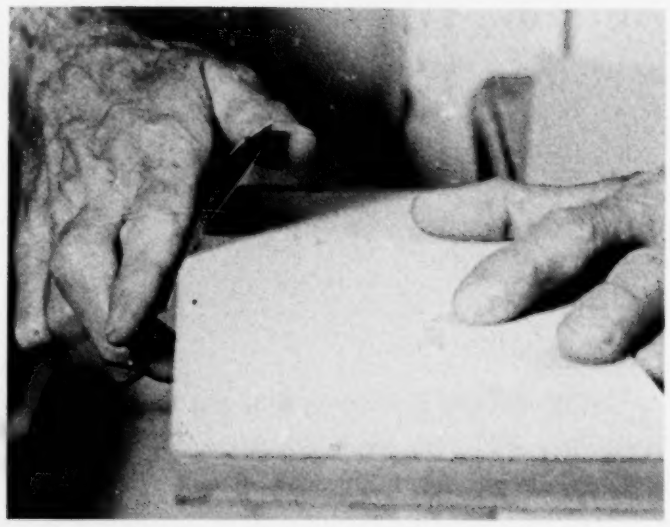


Fig. 85A-4. Sanding Ridge Angle

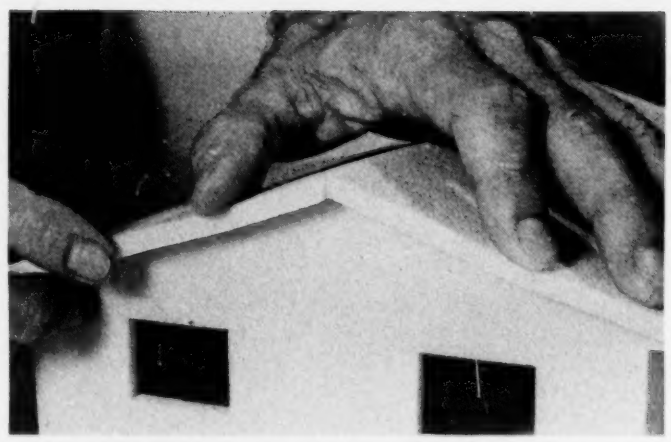


Fig. 85A-5. Checking Roof Ridge for Fit

ACTIVITY 85B

Building Roofs

Problem

Objective

Using a model structure, plans, equipment and supplies, assemble the roof for the dream house.

Equipment (Per class)

5	T-bevels
5	framing squares
5	try squares
30	Xacto® *or* utility knives

Supplies (Per class)

5 btls.	white glue
250	straight pins
5 shts.	extra fine abrasive paper (8/0)

Supplies (Each student)

1 set	roof trusses and sheathing
1 set	elevation drawings
1	incomplete model house

Preparing to Work

1. Get your equipment and supplies. Share tools as necessary.

Assembling Roofs

2. Assemble the roof sections with glue and pins. See. Fig. 85B-1.
3. When the glue has set, secure the roof to the trusses with glue and pins.
4. If needed, glue additional trusses to the inside of the roof. (**Note:** Do *not* glue the roof to the walls.) See Fig. 85B-2.

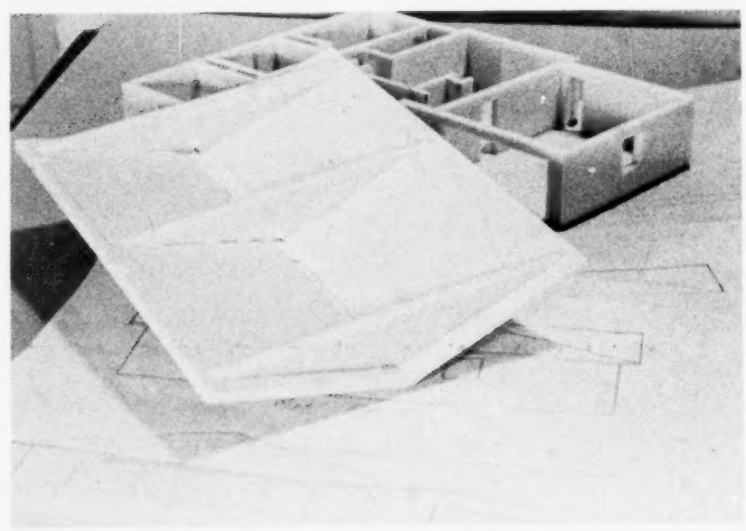


Fig. 85B-2. Roof Trusses Glued in Place

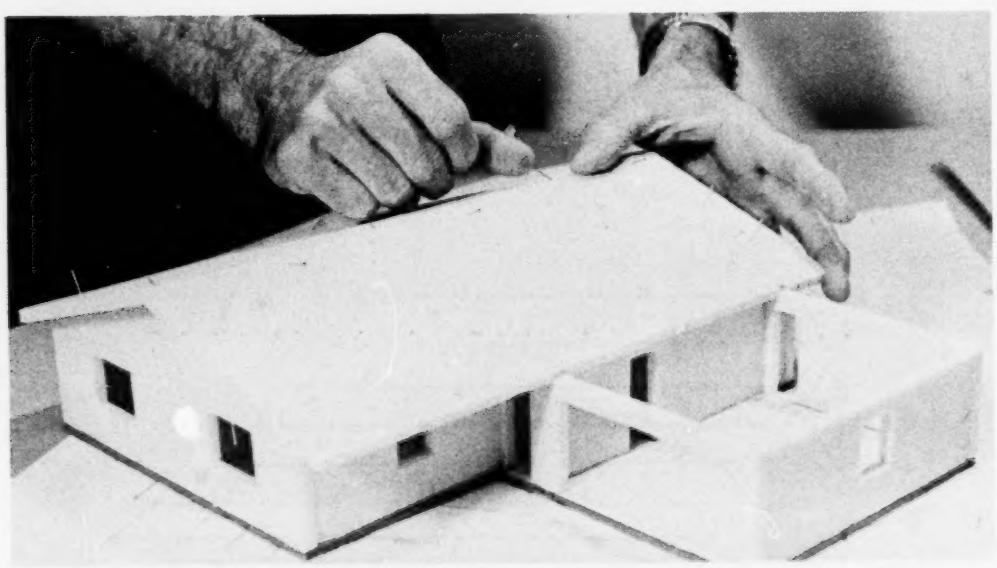


Fig. 85B-1. Assembling Roof Sections

5. If your house has an intersecting gable roof, follow the instructions from the demonstration to construct the gable roof as shown in Figs. 85B-3 and 85B-4.
6. If roofing papers are not used, pencil grooves on the roof decking to symbolize shingles. See Fig. 85B-5.

Cleaning Up

7. Return all equipment, supplies, and materials to proper storage.

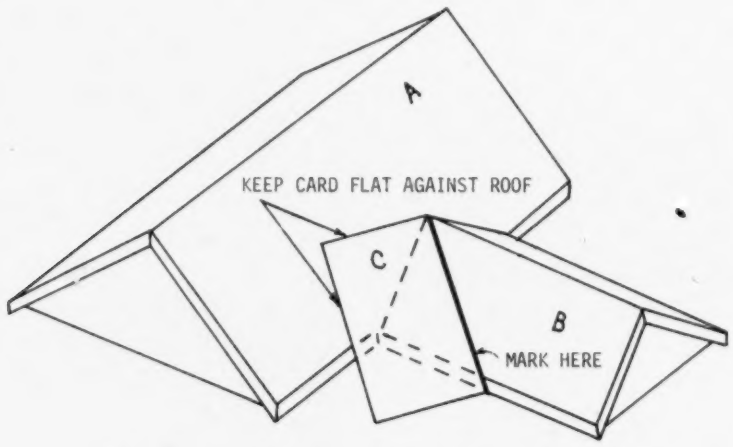


Fig. 85B-3. Marking Angle of Roof Slope

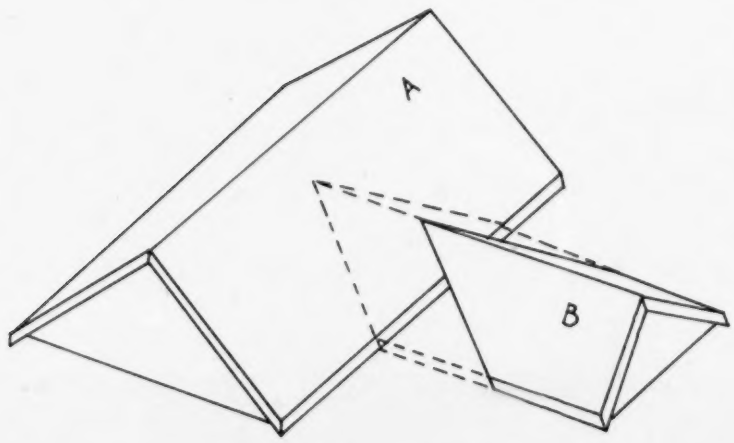


Fig. 85B-4. Cut and Test Roof Fit

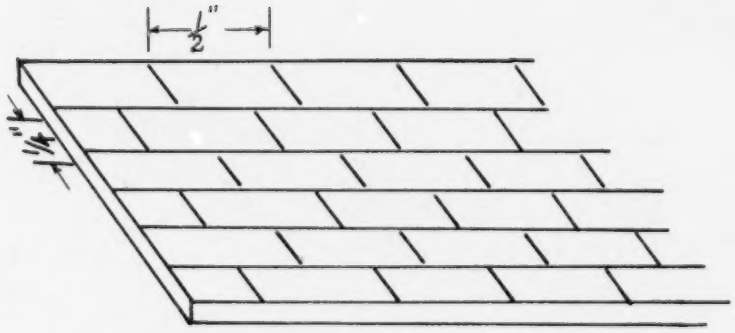


Fig. 85B-5. Marking Roof to Look Like Shingles

ACTIVITY 85C

Building Roofs

Problem

Objective

Using proper equipment and supplies, complete the roof for a model dream house.

Equipment (Per class)

30 Xacto® *or* utility knives
5 T-bevels
5 framing squares
5 try squares

Supplies (Per class)

5 btls. white glue
300 straight pins
5 shts. extra fine abrasive paper (8/0)

Supplies (Each student)

¼" urethane foam, as needed
1 set elevation drawings
1 incomplete model house

Completing Roofs

1. Use this period to complete the roof for your dream house.
2. When you have completed the roofing, study Chart 85C-1 to get some ideas about materials you might be able to use for landscaping.
3. If you have completed all work on your dream house up to this point, check with your teacher about helping another student get his dream house completed so you can all begin Activity 86A at the same time.

Cleaning Up

4. Return all equipment and supplies to proper storage, and clean up the work area.

Chart 85C-1
Suggested Landscaping Materials

Part	Model Material	Methods of Construction
Contours on model site area	Model site board, wire screen, and paper mache	Built up hilly areas or contours with paper mache over wire screen.
Grass	Construction paper Green paint Dyed sawdust Grass paper	Cut out and glue in place. Paint grass area. Apply dyed sawdust material, removing excess when dry. (Sawdust dyed green with green food coloring or water-color paint.)
Trees and bushes	Sponge Lichen (Available at model stores) Model trees Twigs and steel wool	Grind sponges. Paint different shades of green. Use small pieces for bushes. Glue small pieces to twigs for trees. Lichen may be used in the same manner as sponges. Glue into place; follow landscaping plan. Spray paint steel wool and glue to twigs.
Gravel paths	Shellac or white glue and coarse white sand	Glue or shellac pathway, and sprinkle sand over wet shellac or glue.
Stone walls	Cardboard or construction paper in appropriate colors Stone-pattern paper	Stone walls may be drawn on cardboard, painted, cut out with a sharp knife, and glued in place.
Fences	Wire screening, wood fence, swab sticks or toothpicks, plastic fence	Cut to size, glue to posts, and glue in place.
Flagstone paths and terraces	Real slate chips, painted cardboard, or colored construction paper, stone-pattern paper	Glue in place where needed.
Flowers	Grape Nut Flakes, Japanese sea moss, dried flowers, artificial flowers, artificial greens (holiday decorations)	Shellac flower bed and sprinkle flakes. Shellac flower bed and sea moss. Spray with clear plastic and glue in place. Shape and glue in place.
Patio, sidewalks, driveway	Colored construction paper Emery cloth	Glue in place.
Swimming pool, pond, lake	Wrinkled cellophane Mirrors, clear or blue plastic	Glue in place.

Note: Several items from "O" Gauge Model Railroads can be used.

ACTIVITY 86A AND B

Enclosing Exteriors

In Activities 86A and B, you will paint the exterior of your dream house. Begin with either Problem 1 or Problem 2. Move on promptly to the other problem.

Problem 1

Objective

Using tempera paint, paint the roof of your dream house.

Equipment (Class)
15 1½" paint brushes
Supplies (Each student)
1 model dream house
1 small paint container
Supplies (Class)
5 qts. tempera paint (assorted colors)
plastic sheeting *or* newspaper

Safety Precaution

Protect your clothing with a shor apron while painting.

Preparing to Work

1. Get your equipment and supplies. Choose a roof color, and pour a small amount of tempera paint into a container.
2. Protect the work area with plastic sheeting or newspaper.
3. Separate the roof section from the structure.

Painting

4. Paint that part of the roof overhang that you can see from the exterior of your house. See Fig. 86AB-1.
5. Turn the roof over and paint the top surfaces. See Fig. 86AB-2.
6. Clean your brush with water.

Problem 2

Objective

Using latex paint, paint the exterior walls of your dream house.

Equipment (Class)
15 1½" paint brushes

Supplies (Class)
5 pts. latex paint (assorted colors)

Supplies (Each student)
1 model dream house
1 small paint container

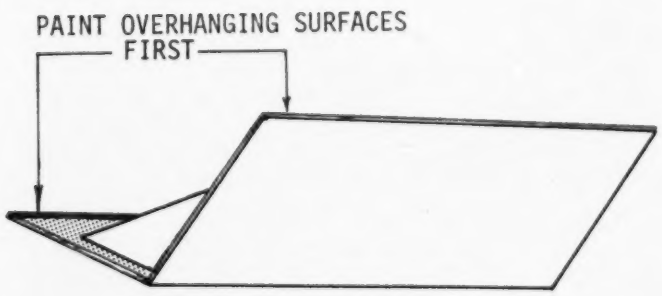


Fig. 86AB-1. Painting Underside of Roof

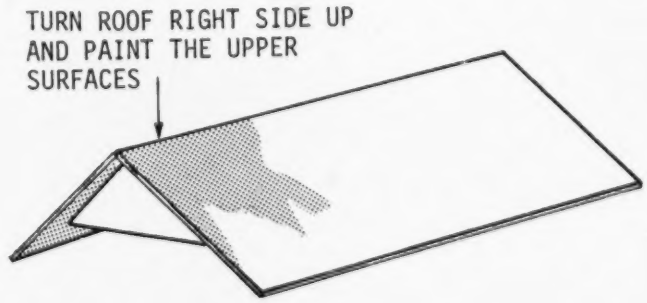


Fig. 86AB-2. Painting Roof

Preparing to Work

1. Get your equipment and supplies. Choose a wall color, and pour a small amount of tempera paint into a container.

2. Protect the work area with plastic sheeting or newspapers.

3. Set the roof section of the house aside.

Painting

4. Paint all the exterior walls.

Cleaning Up

5. Clean your brush with soap and water when you are through painting.
6. Return all equipment, supplies and your model house to proper storage. Clean up the work area.

ACTIVITY 87

Roughing in Utilities

Problem

Objective

Using working drawings and proper equipment and supplies, install windows, doors, and miscellaneous fixtures in the dream house.

Equipment (Each student)

1 Xacto® *or* utility knife
1 architect's scale

Supplies (Per class)

5 shts. transparent plastic window material
5 btls. white glue or rubber cement
5 shts. 8/0 fine abrasive paper

Supplies (Each student)

1 pc. scrap ¼" urethane foam *or* assorted pieces of colored cardboard
1 set elevation drawings

Preparing to Work

1. Get your equipment and supplies.

Installing Windows

2. Measure and cut the windows. (The size should be ¼" larger than the window opening.)
3. Apply cement to the corners of each window. Allow cement to become tacky. Then apply each window to the *inside* of the wall, covering the opening. See Fig. 87-1.

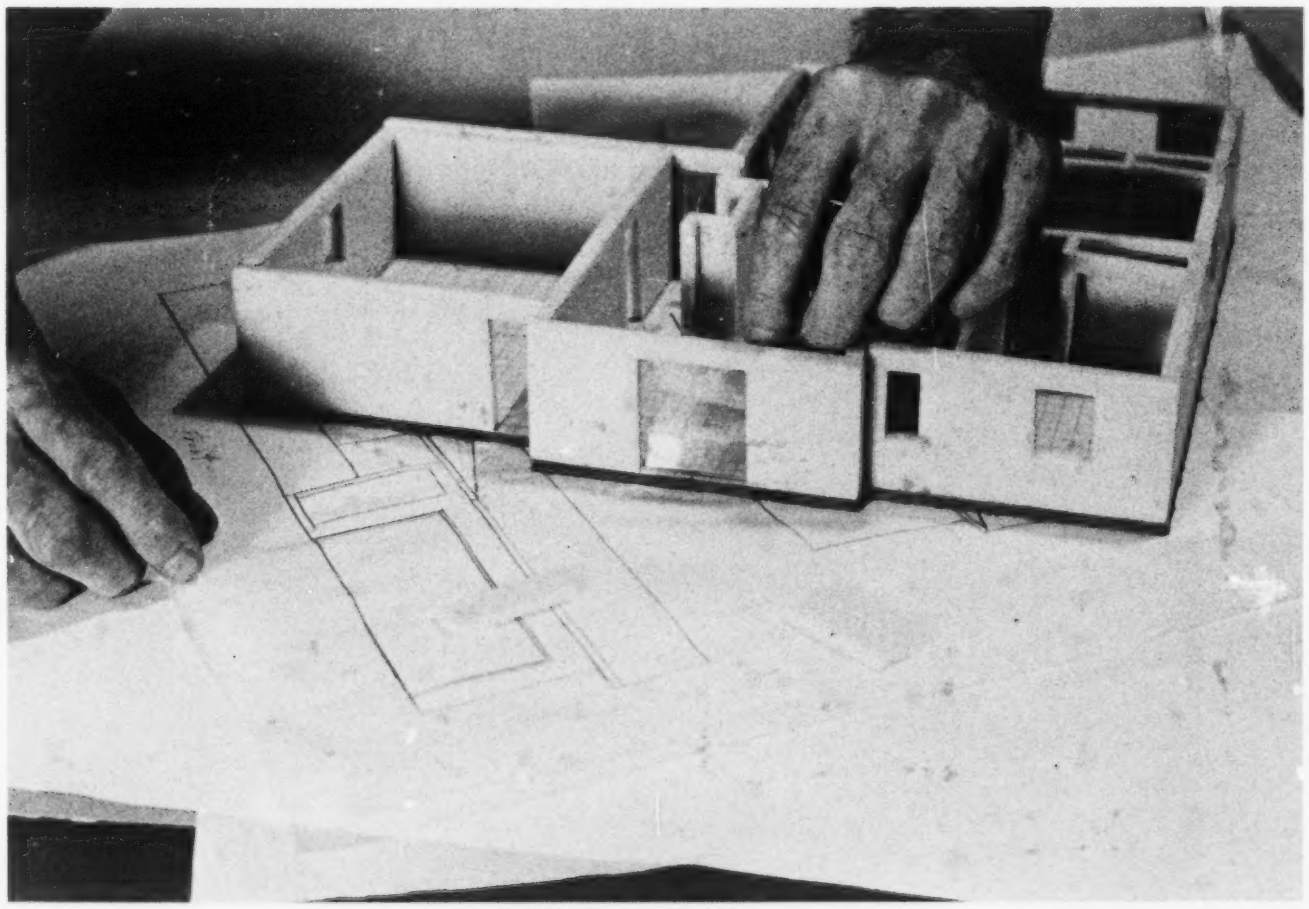


Fig. 87-1. Installing a Window

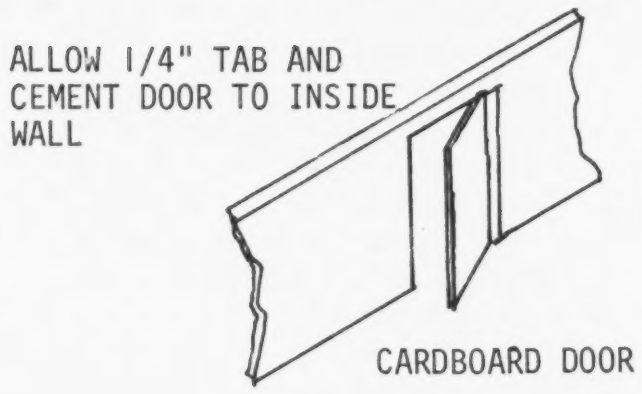

ALLOW 1/4" TAB AND CEMENT DOOR TO INSIDE WALL
CARDBOARD DOOR
GLUE IN PLACE TO CORNER OF DOOR OPENING.
URETHANE FOAM DOOR, SANDED TO 1/8" THICKNESS

Fig. 87-2. Two Ways of Making and Installing a Door

Installing Doors

4. Measure, cut, and fit exterior doors. They may be of cardboard or of urethane foam sanded to $\frac{1}{8}$" thickness. See Fig. 87-2.
5. Cement doors in place as shown in Figs. 87-2 and 87-3.

Other Installations

6. Figure 87-4 shows suggested fixtures and hardware. You may want to include some of these in your dream house.

Cleaning Up

7. Return all materials, supplies, and your model house to proper storage. Clean the work area.

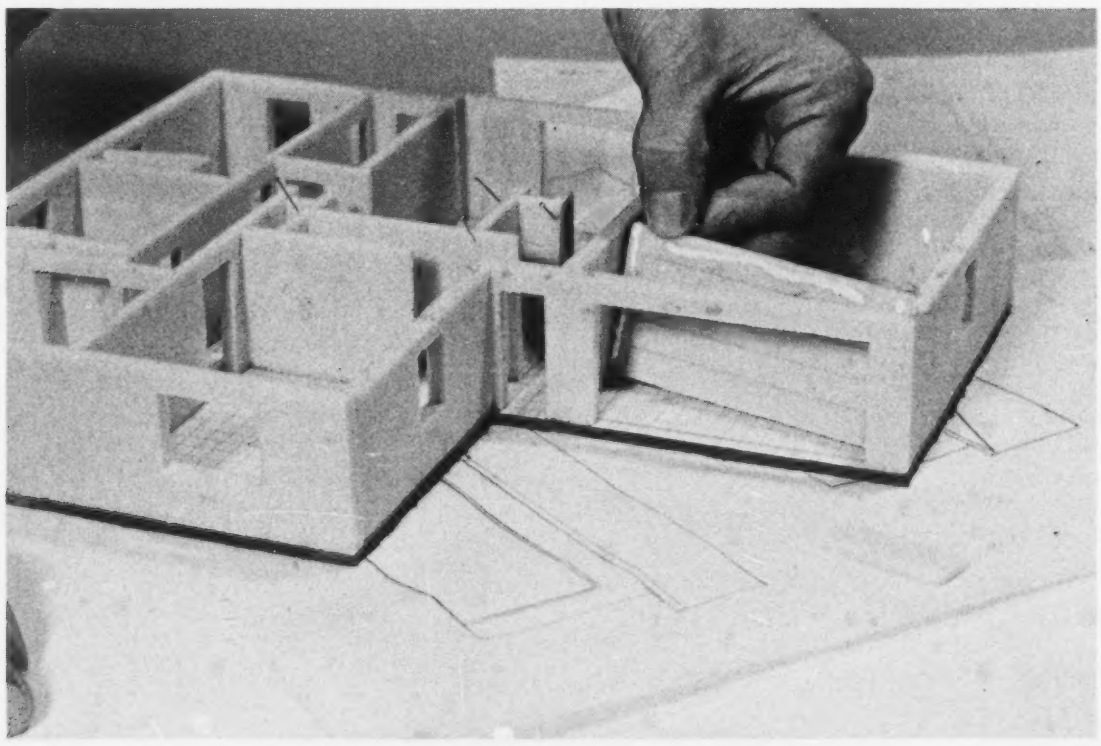


Fig. 87-3. Garage Door Being Set in Place

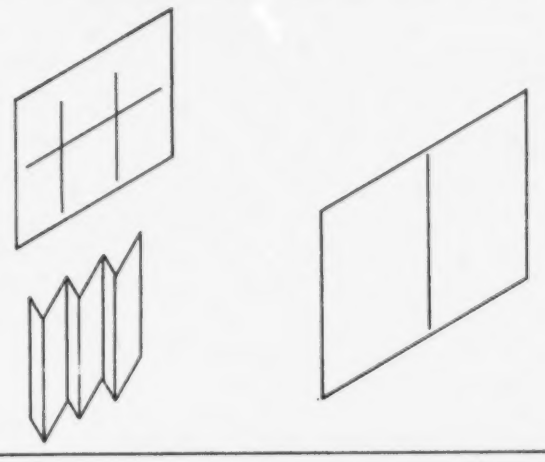
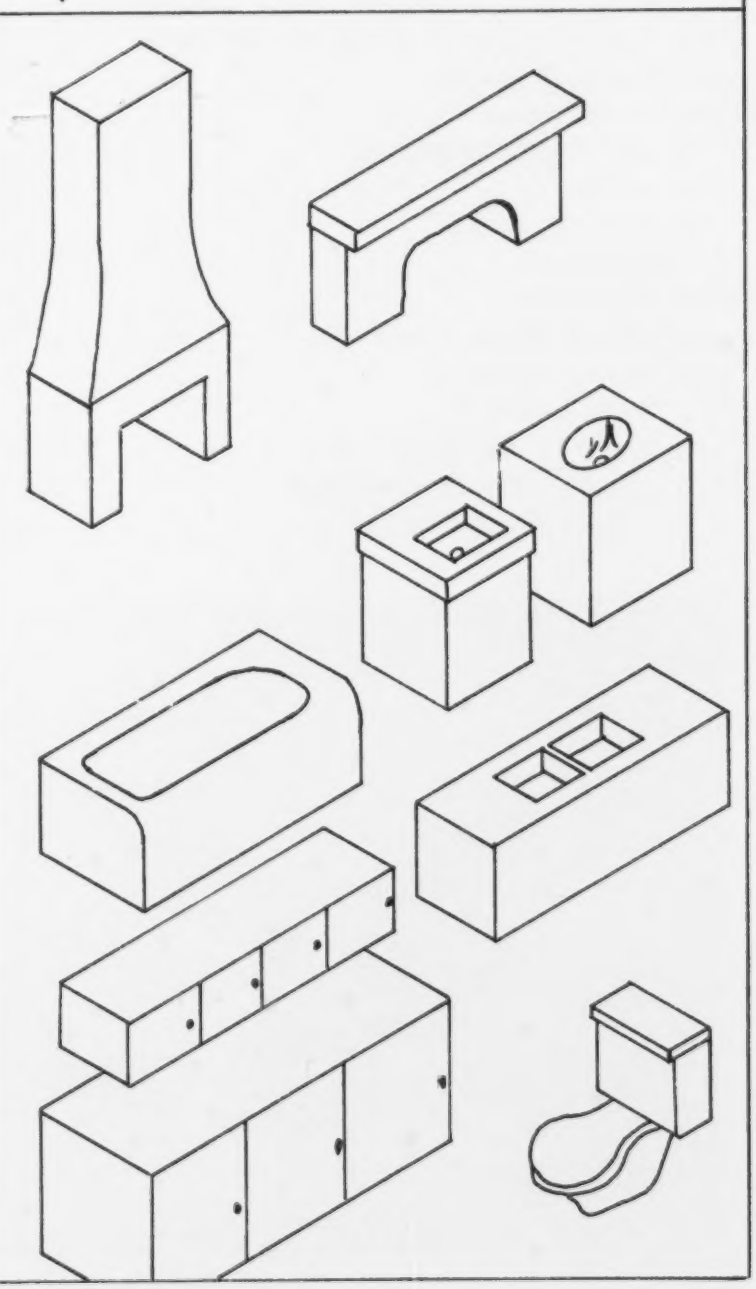
Item	Suggested Materials	Sketches and Notes
Door or window glass	Transparent plastic (thin)	
Sliding or folding door	Urethane foam (sanded) or cardboard	
Chimney Mantle	Urethane foam (thick or glued-up pieces)	
Bathtub Vanity Toilet	or	
Sink Kitchen cabinets Washer Dryer Refrigerator	Balsa wood	

Fig. 87-4. Fixtures and Hardware

ACTIVITY 88

Working on the Interior

Problem

Objective

Using working drawings and proper equipment and supplies, complete the exterior of the dream house.

Equipment (Per class)
25 Xacto® *or* utility knives
5 12″ rules
5 architect's scales
5 try squares

Supplies (Per class)
5 shts. plastic window material
5 shts. veneer material
scrap wood
scrap ¼″ urethane foam
assorted pieces of colored construction paper
5 btls. white glue *or* rubber cement
5 shts. 8/0 fine abrasive paper
300 straight pins

Supplies (Each student)
1 set working drawings
1 model house

Preparing to Work

1. Get your equipment and supplies. Share tools as necessary.

Completing Exteriors

2. Measure, cut, and install brick or stone veneer as shown in Fig. 88-1.
3. Measure, cut, and install any other exterior components such as shutters, steps, and chimneys.
4. If time permits, cut out doors for some interior openings and install them. Use the same procedure as for exterior doors.

Cleaning Up

5. Return all materials, supplies, and model to proper storage. Clean up the work area.

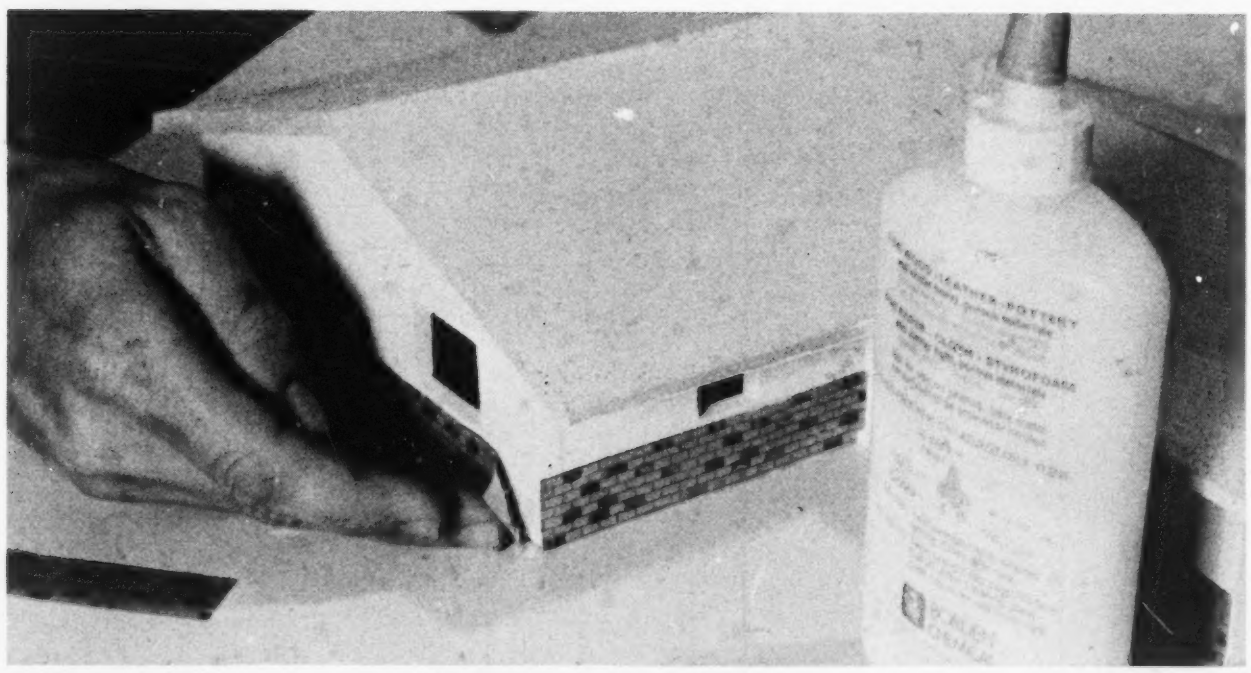


Fig. 88-1. Applying Veneer

1650

ACTIVITY 89

Completing the House

Problem

Objective

Using proper equipment and supplies, complete the interior of the dream house.

Equipment (Per class)

5 12″ rules
5 architect's scales
5 pr. scissors
25 Xacto® *or* utility knives

Supplies (Per class)

5 btls. glue *or* rubber cement
300 straight pins
5 shts. 8/0 abrasive paper

Supplies (Per student)

1 model house
scrap building materials

Preparing to Work

1. Get your equipment and supplies. Share tools as necessary.

Completing Interiors

2. You may install in the interior of your house such items as veneer, partitions, glass walls, interior doors, stairways, and flooring.
3. You may complete the interior of your structure by adding bathtubs, sinks, and kitchen cabinets.

Cleaning Up

4. Return all equipment, supplies, and your model to proper storage. Clean up the work area.

ACTIVITY 90A

Landscaping Homesites

Problem 1

Objective

Using a site board and green construction paper to represent grass, secure the construction paper to the site board.

Equipment (Class)
5 desk staplers with staples
Supplies (Class)
5 btls. white glue
Supplies (Each student)
1 16″ x 24″ site board
1 sht. 18″ x 24″ green construction paper

Preparing the Site

1. Secure a site board and a sheet of construction paper from your teacher.
2. Place the construction paper on your bench and center the site board on the paper.
3. Fold the construction paper over the edges of the site board and glue or staple it to the bottom of the board. See Fig. 90A-1.

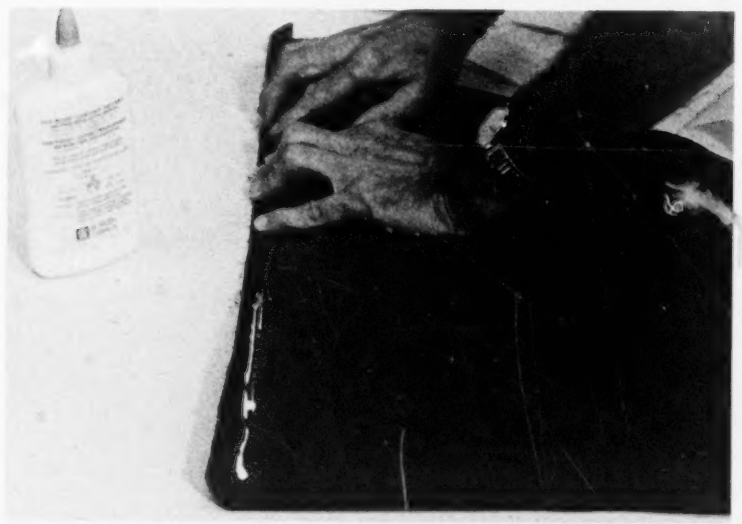


Fig. 90A-1. Paper Is Glued to the Bottom of the Site Board

Problem 2

Objective

Using a plot plan and site board, locate and glue the dream house onto the plot plan.

Equipment (Class)
25 12″ rules
Supplies (Class)
5 btls. glue
Supplies (Each student)
1 model house
1 plot plan

Locating the Structure

1. Using your plot plan as a guide, locate the corners of your structure on the site. Remember that your plot plan was drawn to ⅛″ scale and you are now working with ¼″ scale. Also, plot plans were drawn on lots of various sizes. Therefore, you may not be able to reproduce your plot plan exactly.
2. Place a dab of glue on each corner of the house slab.
3. Set the dream house in place. See Fig. 90A-2.
4. Allow the glue to set before moving the site board.

Cleaning Up

5. Return all equipment, supplies, materials, and the model to proper storage. Clean up the work area.

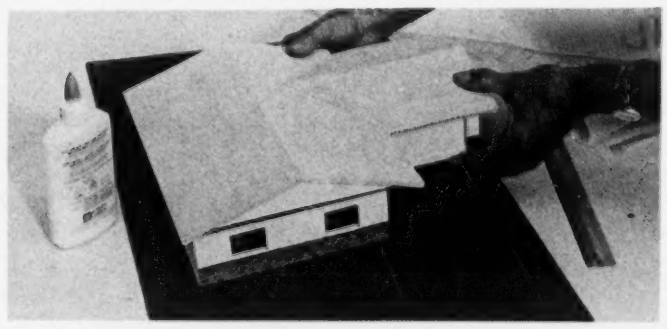


Fig. 90A-2. Locating House on Site Board

ACTIVITY 90B

Landscaping Homesites

Problem 1

Objective

Using the site board and suitable materials, lay out and install driveways and sidewalks.

Equipment (Per class)
25 12″ rules
25 pr. scissors

Supplies (Each student)
1 model house, mounted on site board

Supplies (Per class)
5 btls. white glue
20 shts. 9″ x 12″ construction paper, black
10 shts. 9″ x 12″ construction paper, assorted colors
other appropriate material for driveway or sidewalk

Preparing to Work

1. Get your equipment and supplies.

Installing Accessories

2. Draw lines to represent the edges of the driveway and sidewalks.
3. Check the layout with your teacher.
4. Cut appropriate colored construction paper or other material for driveways and sidewalks, and glue it in place.

Problem 2

Objective

Using site board and assorted materials, lay out and install features on your site such as flower boxes, patios, and fences.

Installing Landscape Features

1. Lay out and install features according to your individual plans. See Fig. 90B-1.
2. Any of these features not finished this period must be finished as homework.

Cleaning Up

3. Return all equipment, supplies, and model house to proper storage. Clean up the work area.

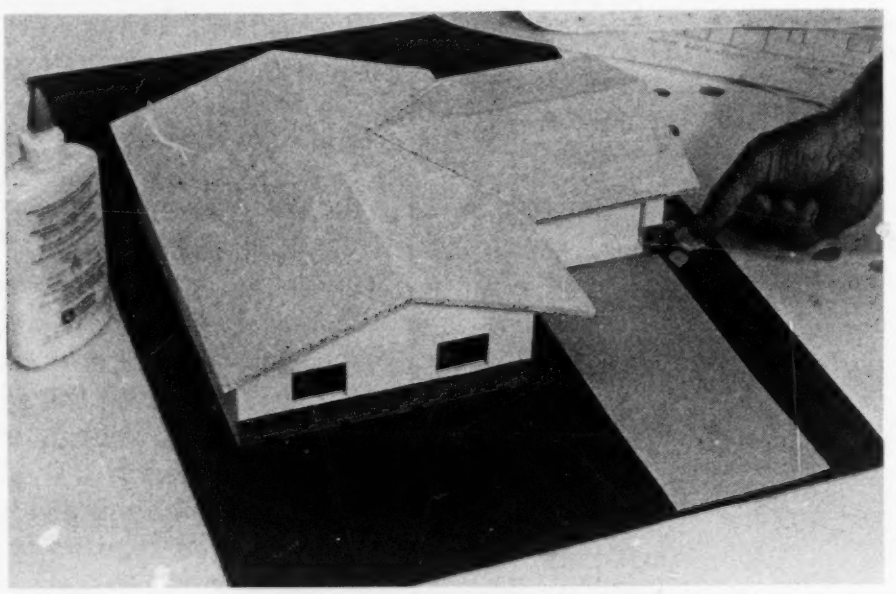


Fig. 90B-1. Landscaping

ACTIVITY 90C

Landscaping Homesites

Problem 1

Objective

Using a plot plan, site board, and a variety of materials, place the trees and shrubs on your site and finish all landscaping.

Equipment (Per class)
25 pr. scissors
Supplies (Each student)
1 model house
1 plot plan
Supplies (Per class)
1 box lichens (to be used for shrubs and trees)
other landscape materials as available
5 btls. white glue

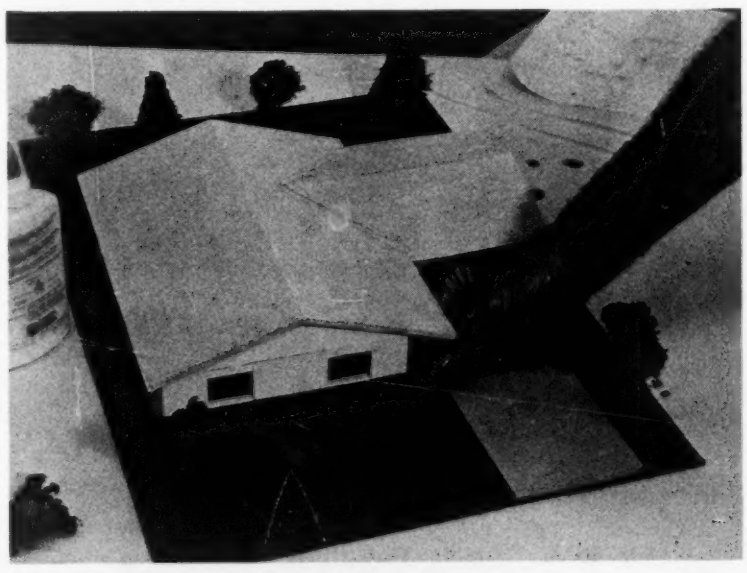


Fig. 90C-1. Setting Shrubs in Place

Preparing to Work

1. Get your equipment and supplies.

Setting Trees and Shrubs

2. Using scissors, cut lichen to ¾″ height for placement under windows. About five shrubs should complete the front of your house. (Refer to your own plot plan too.)
3. Shrubs at the corners of your house should be between 1″ and 1½″ high.
4. Glue shrubs in place. See Fig. 90C-1.
5. If you have trees, glue them in place.
6. Do other landscape work as time permits. See Fig. 90C-2.

Chart 90C-1
Criteria for Evaluation of Dream House

1. Are all rooms on an outside wall with windows or other provisions made for ventilation?
2. Are there at least two entrances to the house?
3. Can a person carry groceries into the kitchen without going through another room?
4. Can you get from all bedrooms to a bathroom without going through any other room?
5. Could you omit part of the hallways by a different room arrangement?
6. Are all hallways at least 4′ wide?
7. Are all doors going into rooms at least 2′ 6″ wide?
8. Could the size of the windows be changed for a more pleasing design?
9. Are you satisfied with the design of your roof?
10. Could you suggest changes in the landscape design which might improve the appearance?
11. Have you used the scale of ¼″ = 1′ throughout your home? How about the chimney?
12. How would you grade your "Dream House" in relation to others in your class?

Problem 2

Objective

Using a list of criteria in Chart 90C-1, judge your dream house.

Evaluation

1. Read the items in Chart 90C-1 and answer the questions after studying your dream house.
2. Make a list of ways you could improve your dream house.

Cleaning Up

3. Return all materials, supplies, and equipment to proper storage. Clean up the work area.

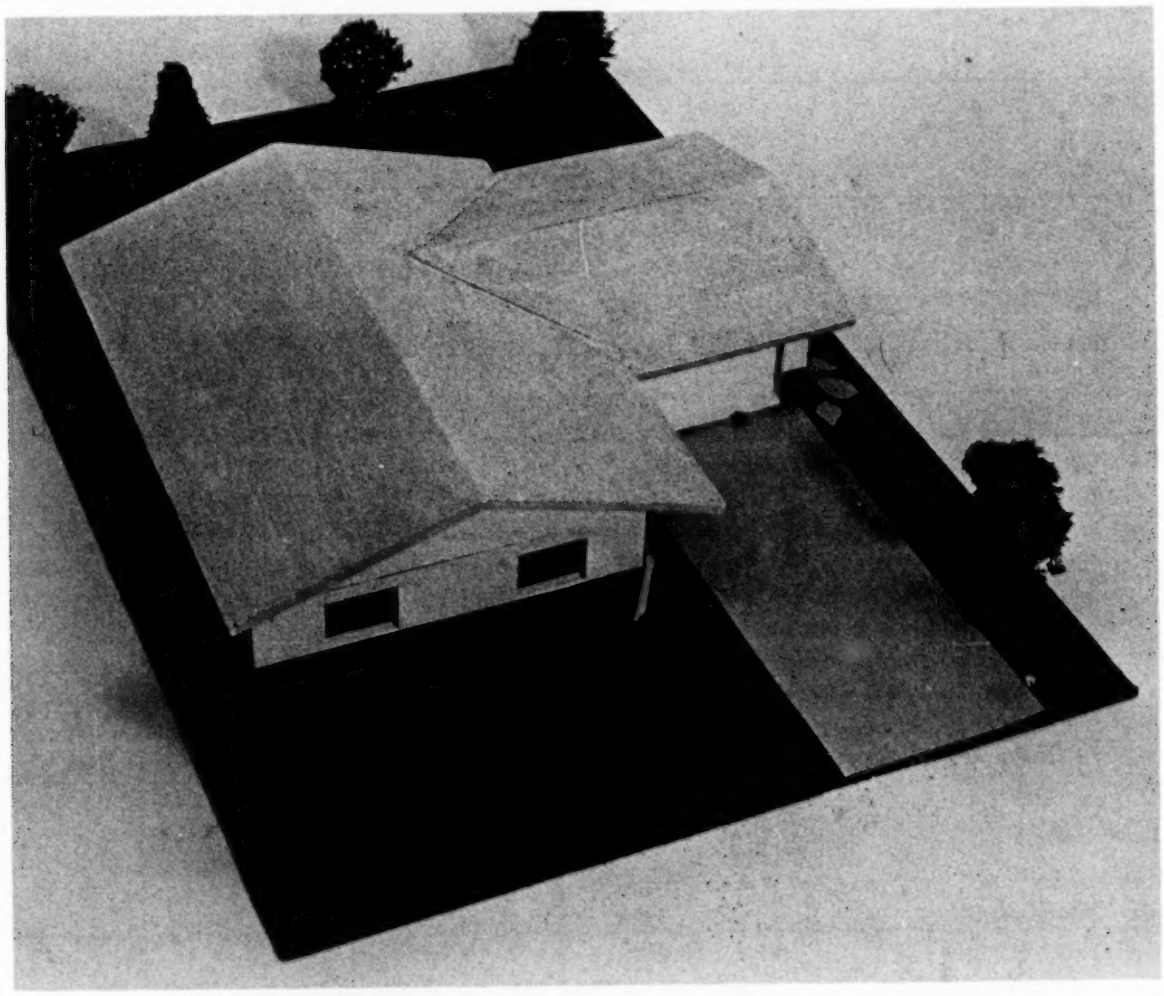


Fig. 90C-2. Landscaping Complete

ACTIVITY 91

City and Regional Planning Factors

Problem

Objective

Using information from the lecture, the Apollo County map, and the charts in Laboratory Activity 91, select a site and figure a land price for the Sonic Jet plant.

Chart 91-1
Potential Sites for Sonic Jet Plant

	Square groups of four 10-acre tracts with railroad at one side, state route at one one side, and river at one side.						
TRACT NUMBERS: Conditions	W3 W4 W7 W8	X1 X2 X3 X4	Y1 Y2 Y3 Y4	D1 D2 D3 D4	E3 E4 E7 E8	F1 F2 F5 F6	F3 F4 F7 F8
Are tracts all flat? (yes or no)							
Are tracts either all firm or all hard? (yes or no)							
Do all tracts meet both of these conditions? (yes or no)							

Chart 91-2
Land Price of Tract Group

Conditions	1st Tract No: _____	2nd Tract No: _____	3rd Tract No: _____	4th Tract No: _____
LAND FACTORS: Flat — Add $10,000 Sloped — Add $10,000 Steep — Add $5,000	$_____,000	$_____,000	$_____,000	$_____,000
Soft — Add $1,000 Firm — Add $10,000 Hard — Add $15,000	$_____,000	$_____,000	$_____,000	$_____,000
TRANSPORTATION FACTORS: River — Add $10,000/side	$_____,000	$_____,000	$_____,000	$_____,000
Road — Add $10,000/side	$_____,000	$_____,000	$_____,000	$_____,000
Railroad — Add $10,000/side	$_____,000	$_____,000	$_____,000	$_____,000
TOTAL COST OF TRACT	$_____,000	$_____,000	$_____,000	$_____,000

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Chart 91-3
Land Prices from Chart 91-2

Land Price of First Tract	$_____,000
Land Price of Second Tract	$_____,000
Land Price of Third Tract	$_____,000
Land Price of Fourth Tract	$_____,000
Total Land Price of Group (Add the four figures above.)	$_____,000

Chart 91-4
Site Selected for Sonic Jet Plant

Tract Group Selected by the Class	Total Land Price of Tract Group
	$_____,000

ACTIVITY 92

Planning Community Services

Problem

Objective

Using the Apollo County map:

a. Decide on the appropriate water and sewage plant sites.

b. Estimate the capacity and cost of water and sewage utilities.

Chart 92-1

Selecting the Water Plant Site

Conditions	S1	R6	R5
Is land either flat or sloped? (yes or no)			
Does tract have either firm or hard soil? (yes or no)			
SITE OF WATER PLANT furthest upstream. (yes or no)			

Chart 92-2

Selecting the Sewage Plant Site

Conditions	F2	F3	F4
Is soil either firm or hard? (yes or no)			
Is land either flat or sloped? (yes or no)			
SITE OF SEWER PLANT furthest downstream. (yes or no)			

Chart 92-4

Utility Plant Capacity and Cost

WATER PLANT		SEWER PLANT	
Capacity—Water Units	Costs	Capacity—Sewage Units	Costs
1,000	$108,000	1,000	$110,000
3,000	$224,000	2,000	$180,000

Chart 92-3

Estimating the Land Price of Utility Plant Tracts

Conditions	WATER PLANT Tract No. _____	SEWAGE PLANT Tract No. _____
Land Factors: Flat — Add $10,000 Sloped — Add $10,000 Steep — Add $5,000	$_____,000	$_____,000
Soft — Add $1,000 Firm — Add $10,000 Hard — Add $10,000	$_____,000	$_____,000
River — Add $10,000/side	$_____,000	$_____,000
Land Price of Tract (add)	$_____,000	$_____,000

Chart 92-5
Total Utility Plant Development Cost

	WATER PLANT	SEWAGE PLANT
Utility Units Needed	900	600
Plant Capacity to be Provided	_____ Water units	_____ Sewage Units
Cost of Utility Plant	$_____	$_____
Land Price of Tract (Chart 92-3)	$_____	$_____
Total Cost of Water Plant (add)	$_____	
Total Cost of Sewage Plant	$_____ ←	$_____
Total Cost of Utility Plants (add the 2 costs above)	$_____	

Chart 92-6
Utility Pipe Capacity

WATER PIPES Capacity			SEWER PIPES Capacity		
Water Units	Size	Cost/Side	Sewer Units	Size	Cost/Side
100	4″	$2,000	80	8″	$3,000
400	8″	$3,000	220	12″	$4,000
1,000	12″	$4,000	750	24″	$10,000

Chart 92-7
Community Share—Total Utility Cost

Total Cost of Utility Plants (Chart 92-5)	$_____,000
Total Utility Pipe Cost (Chalkboard)	$_____,000
Total Utility Cost (Add)	$_____,000
Community Share of Water and Sewer Cost (½ of "Total Utility Cost")	$_____,000

Chart 92-8
Developer's Share of Community Water and Sewage Cost

Developer's Share (1/100 of Community Share of Water and Sewer Cost)	$_____

ACTIVITY 93

Housing People

Problem

Objective

1. Using your map of Sonic City, determine the type and number of houses for 3,320 people.
2. Determine the profit or loss of a land developer.

Team Name _____

Captain's Name _____

Chart 93-1
Estimating the Housing Market

Worker Income Level	Housing Type Needed	Housing Units/ Tract	No. of Housing Units Needed	No. of Tracts Needed (whole tracts only)
$15,000 per year	SF (3)		360	
$10,000 per year	SF (5)		1000	
$ 5,000 per year	SF (7)		1960	
		Totals	3320	

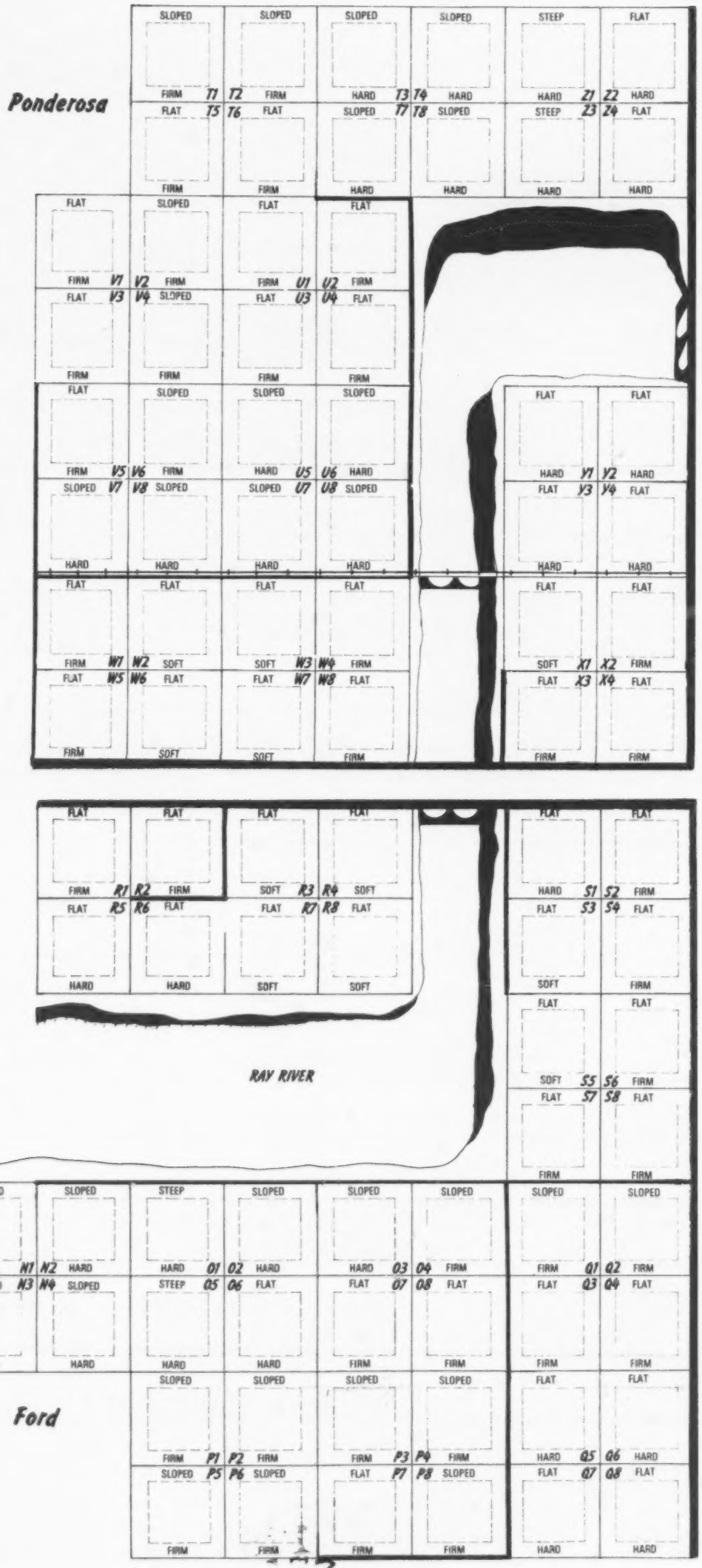
Chart 93-2
Tract Study Assignments

Housing Type	SF (3)	SF (5)	SF (7)
Slope Needed	Any	Any	Any
Soil Needed	Firm or Hard	Firm or Hard	Firm or Hard
Tracts Meeting These Needs (Tract Nos.)	_____ _____ _____	___ ___ ___ ___ _____	___ ___ ___ ___ ___ ___ _____
Team Member Assigned to Tract (Name)			

Chart 93-3

Profit or Loss from Sale of Housing Units

Housing Type	Tract No. (Record)	Development Cost for Each Tract	Potential Sales Income for Each Tract Sold	Tract Unsold? (check)	Sales Income For Tracts Sold (Record)
SF (3)		$670,000	$900,000		$_____,000
		$670,000	$900,000		$_____,000
		$670,000	$900,000		$_____,000
SF (5)		$670,000	$900,000		$_____,000
		$670,000	$900,000		$_____,000
		$670,000	$900,000		$_____,000
		$670,000	$900,000		$_____,000
		$670,000	$900,000		$_____,000
SF (7)		$630,000	$840,000		$_____,000
		$630,000	$840,000		$_____,000
		$630,000	$840,000		$_____,000
		$630,000	$840,000		$_____,000
		$630,000	$840,000		$_____,000
		$630,000	$840,000		$_____,000
		$630,000	$840,000		$_____,000
Total Development Cost		$9,770,000	Total Sales Income for Tracts Sold		$_____,000
			Total Development Cost (Subtract)		−$9,770,000
			Developer's Profit or Loss		$,000


Ponderosa
SLOPED SLOPED SLOPED SLOPED STEEP FLAT
FIRM T1 T2 FIRM HARD T3 T4 HARD HARD Z1 Z2 HARD
FLAT T5 T6 FLAT SLOPED T7 T8 SLOPED STEEP Z3 Z4 FLAT
FIRM FIRM HARD HARD HARD HARD
FLAT SLOPED FLAT FLAT
FIRM V1 V2 FIRM FIRM U1 U2 FIRM
FLAT V3 V4 SLOPED FLAT U3 U4 FLAT
FIRM FIRM FIRM FIRM
FLAT SLOPED SLOPED SLOPED FLAT FLAT
FIRM V5 V6 FIRM HARD U5 U6 HARD HARD Y1 Y2 HARD
SLOPED V7 V8 SLOPED SLOPED U7 U8 SLOPED FLAT Y3 Y4 FLAT
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FIRM W1 W2 SOFT SOFT W3 W4 FIRM SOFT X1 X2 FIRM
FLAT W5 W6 FLAT FLAT W7 W8 FLAT FLAT X3 X4 FLAT
FIRM SOFT SOFT FIRM FIRM FIRM
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FIRM R1 R2 FIRM SOFT R3 R4 SOFT HARD S1 S2 FIRM
FLAT R5 R6 FLAT FLAT R7 R8 FLAT FLAT S3 S4 FLAT
HARD HARD SOFT SOFT SOFT FIRM
FLAT FLAT
SOFT S5 S6 FIRM
FLAT S7 S8 FLAT
FIRM FIRM
RAY RIVER
SLOPED SLOPED STEEP SLOPED SLOPED SLOPED SLOPED SLOPED
HARD N1 N2 HARD HARD O1 O2 HARD HARD O3 O4 FIRM FIRM Q1 Q2 FIRM
SLOPED N3 N4 SLOPED STEEP Q5 O6 FLAT FLAT O7 O8 FLAT FLAT Q3 Q4 FLAT
HARD HARD HARD HARD FIRM FIRM FIRM FIRM
SLOPED SLOPED SLOPED SLOPED FLAT FLAT
FIRM P1 P2 FIRM FIRM P3 P4 FIRM HARD Q5 Q6 HARD
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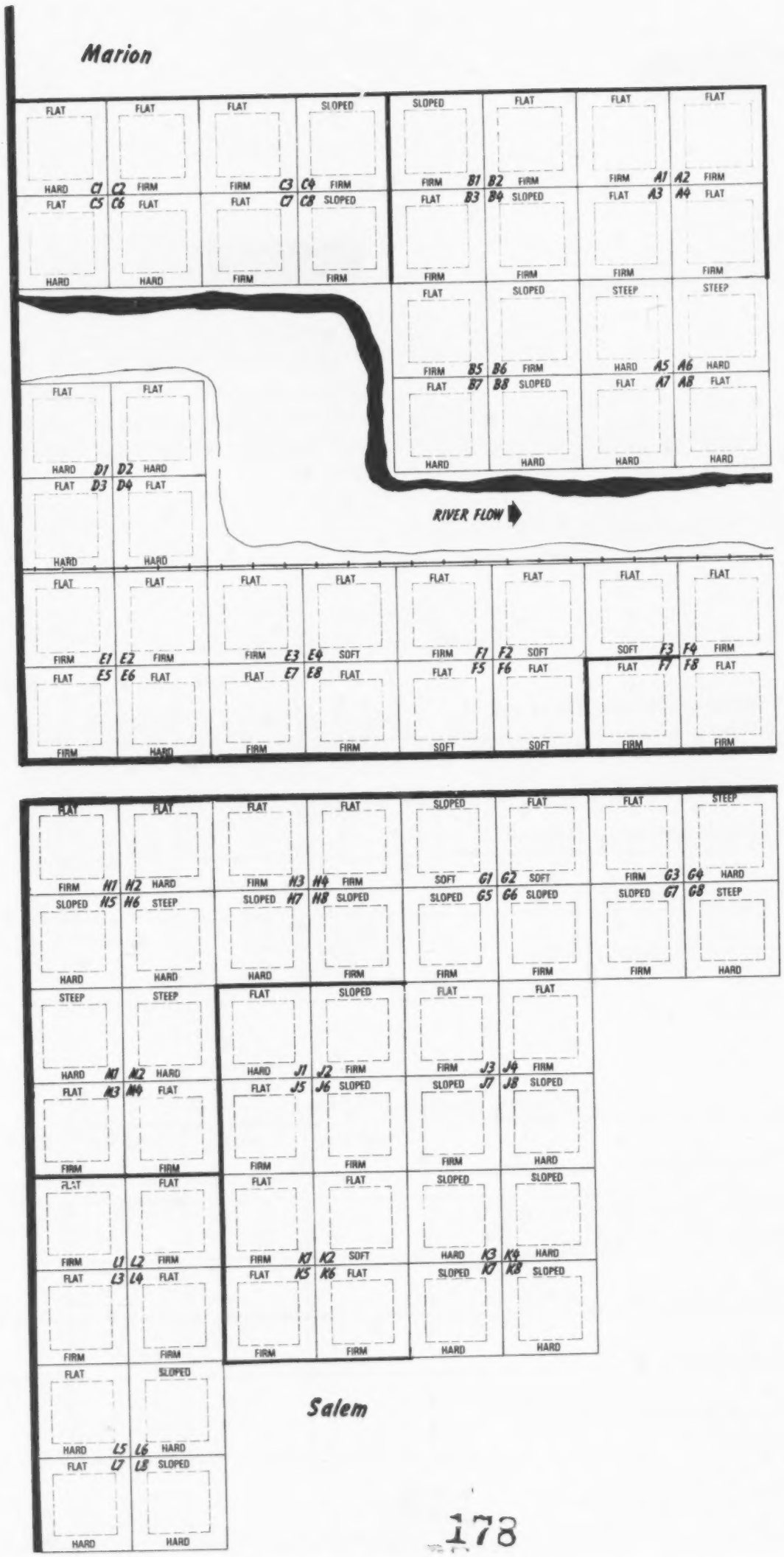
FIRM FIRM FIRM FIRM HARD HARD
Ford


Marion
FLAT HARD C1
FLAT C2 FIRM
FLAT FIRM C3
SLOPED C4 FIRM
FLAT C5 HARD
C6 FLAT HARD
FLAT C7 FIRM
C8 SLOPED FIRM
SLOPED FIRM B1
FLAT B2 FIRM
FLAT FIRM A1
A2 FIRM
FLAT B3 FIRM
B4 SLOPED FIRM
FLAT A3 FIRM
A4 FLAT FIRM
FLAT FIRM B5
SLOPED B6 FIRM
STEEP HARD A5
STEEP A6 HARD
FLAT B7 HARD
B8 SLOPED HARD
FLAT A7 HARD
A8 FLAT HARD
FLAT HARD D1
FLAT D2 HARD
FLAT D3 HARD
D4 FLAT HARD
RIVER FLOW
FLAT FIRM E1
FLAT E2 FIRM
FLAT FIRM E3
FLAT E4 SOFT
FLAT FIRM F1
FLAT F2 SOFT
FLAT SOFT F3
FLAT F4 FIRM
FLAT E5 FIRM
E6 FLAT HARD
FLAT E7 FIRM
FLAT E8 FIRM
FLAT F5 SOFT
FLAT F6 SOFT
FLAT F7 FIRM
F8 FLAT FIRM
FLAT FIRM H1
FLAT H2 HARD
FLAT FIRM H3
FLAT H4 FIRM
SLOPED SOFT G1
FLAT G2 SOFT
FLAT FIRM G3
STEEP G4 HARD
SLOPED H5 HARD
H6 STEEP HARD
SLOPED H7 HARD
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SLOPED G5 FIRM
SLOPED G6 FIRM
SLOPED G7 FIRM
SLOPED G8 STEEP HARD
STEEP HARD K1
STEEP K2 HARD
FLAT HARD J1
SLOPED J2 FIRM
FLAT FIRM J3
FLAT J4 FIRM
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FLAT K4 FIRM
FLAT J5 FIRM
SLOPED J6 FIRM
SLOPED J7 FIRM
SLOPED J8 HARD
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FLAT FIRM K7
FLAT K2 SOFT
SLOPED HARD K3
SLOPED K4 HARD
FLAT L3 FIRM
L4 FLAT FIRM
FLAT K5 FIRM
SLOPED K6 FIRM
SLOPED K7 HARD
SLOPED K8 HARD
FLAT HARD L5
SLOPED L6 HARD
FLAT L7 HARD
SLOPED L8 HARD
Salem

ACTIVITY 94

Planning Business Facilities

Problem

Objective

Using the Apollo County Map and the charts provided, select the site and figure the cost for developing a local shopping center and central business district in a community.

Chart 94-1
Selecting Sites for Local Shopping Center

Conditions (Answer Yes or No)	Tract No. _____	Tract No. _____	Tract No. _____	Tract No. _____
Are two adjoining sides of the tract bordered by a highway or a street?				
Is the land either flat or sloped?				
Are the soils either firm or hard?				
Does this tract meet all of these conditions?				

Chart 94-3
Potential Sites for Central Business Construction

Conditions (Answer Yes or No)	Tract No. _____	Tract No. _____	Tract No. _____	Tract No. _____
Are two adjoining sides of the tract bordered by a major highway?				
Is the land either flat or sloped?				
Is the land either firm or hard?				
Does this tract meet all of these conditions?				

Chart 94-2
Developer's Cost and Profit for Development of Local Shopping Center

Township Name _____	Tract No. ____
Land Factors: Flat—Add $30,000 Sloped—Add $25,000 Steep—Add $20,000	$_____,000
Soft—Add $20,000 Firm—Add $25,000 Hard—Add $30,000	$_____,000
Transportation Factors: Two adjoining sides bordered by highway—Add $30,000 One adjoining side bordered by highway, otherside bordered by street—Add $25,000 Two adjoining sides bordered by street—Add $20,000	$_____,000
Development Factors: If SF housing units do not exist on the tract, land value is greater—Add $20,000	$_____,000
If SF housing units exist next to the tract, land value is greater—Add $20,000 for each side	$_____,000
If sewer pipes are next to the tract, land value is greater—Add $10,000	$_____,000
If water pipes are next to the tract, land value is greater—Add $10,000	$_____,000
Total Land Price (Add)	$_____,000
Construction Cost/Tract	$ 600,000
Total Development Cost (Add Land and Construction Cost)	$_____,000
Potential Sales Income	$ 1,500,000
(Subtract Development Costs)	$_____,000
Potential Developer's Profit or Loss	$_____,000

Chart 94-4
Developer's Cost and Profit for Development of Central Business Construction

Township Name _____	Tract No. ____
Land Factors: Flat—Add $30,000 Sloped—Add $25,000 Steep—Add $20,000	$_____,000
Soft—Add $20,000 Firm—Add $25,000 Hard—Add $30,000	$_____,000
Transportation Factors: Two adjoining sides bordered by major highway— Add $100,000	$_____,000
Any side bordered by railroad—Add $20,000	$_____,000
Development Factors: If SF housing units do not exist on the tract—Add $20,000	$_____,000
If SF housing units exist next to the tract—Add $20,000	$_____,000
If sewer pipes are next to the tract—Add $10,000	$_____,000
If water pipes are next to the tract—Add $10,000	$_____,000
Total Land Price (Add)	$_____,000
Construction Cost of a Central Business Tract	$10,000,000
Total Development Cost (Add)	$_____,000
Potential Sales Income	$17,000,000
(Subtract Development Cost)	_____,000
Potential Developer's Profit or Loss	$_____,000

Chart 94-5
Shopping Center Central Business

From Chart 94-1 and 94-2 Tract No. Selected	From Chart 94-2 and 94-4 Total Development Cost	From Chart 94-2 and 94-4 Developer's Profit or Loss
	$_____,000	$_____,000
	$_____,000	$_____,000
	Total Profit or Loss	$_____,000

ACTIVITY 95A

Planning Schools and Recreational Facilities

Problem

Objective

Using the Apollo County map and charts from Activity 95A:

a. Select the appropriate sites for school and park construction.
b. Figure the cost of school and park construction.

Township_____

Chart 95A-1
Number of Schools and Tracts Needed

School Type	Housing Units Served	No. of Tracts Needed	Cost of Construction
Elementary	700—1700	1	$350,000
Jr. Sr. High	3000—7000	2	$1,500,000

Chart 95A-2
Selecting School Tracts

	Elementary School		Junior-Senior High	
	Tract #1	Tract #2	Tract #1	Tract #2
Tract Numbers				
Is each tract either flat or sloped? (yes or no)				
Is the soil either firm or hard?				
	When the children walk to school, will they be able to avoid busy intersections?		Is the tract near a main street?	
Does each site meet all of the above conditions?				
Elementary School Sites Selected: Tract No._____ Tract No._____ Jr.-Sr. High School Sites Selected: Tract No._____ Tract No._____				

Chart 95A-3
School Costs

Number of Elementary Tracts Needed_____ x $70,000 (land cost per tract)	$_____,000
If the selected tract is developed, add $15,000 for demolition and clearing.	$_____,000
Cost of Construction Elementary School (See Chart 95A-1)	$_____,000
Total Elementary School Cost	$_____,000
Number of Junior-Senior High Tracts Needed_____ x $70,000 (land cost per tract)	$_____,000
If the selected tract is developed, add $15,000 for demolition and clearing.	$_____,000
Cost of Construction Junior-Senior High (See Chart 95A-1)	$_____,000
Total Jr.-Sr. High School Cost	$_____,000
Total School Costs	$_____,000

Chart 95A-4
Park Costs

Tracts Selected	Neighborhood Park Tract No._____	Community Park Tract No.____ Tract No.____
Land Factors: Add $10,000 per tract (any terrain or soil density is desirable)	$_____,000	$_____,000
If tract is *developed* add $15,000 per tract	$_____,000	$_____,000
If utilities (water and sewage) *do not* border a tract, add $15,000	$_____,000	$_____,000
Total Land Price (Add)	$_____,000	$_____,000
Cost of Park Construction	$60,000	$100,000
Total Development Cost of Each Park	$_____,000	$_____,000
Total Cost for Both Parks	$_____,000	

ACTIVITY 95B

Expanding Community Services

Problem 1

Objective

Using the Apollo County map and the following charts, select the sites and figure the cost for high density housing in your township.

Problem 2

Objective

Using the Apollo County map and the following charts, figure the profit or loss for the construction of an interchange.

Chart 95B-3
Reimbursement Table

HR (60)	$14,000,000
MF (25)	$ 2,300,000
MF (15)	$ 2,000,000
SF (3)	$ 800,000
SF (5)	$ 800,000
SF (7)	$ 600,000
Elem. Sch.	$ 1,200,000
Jr.-Sr. H. Sch.	$ 3,500,000
Shop. Center	$ 2,000,000
Cen. Bus. Dist.	$17,000,000
Neighborhood Park	$ 100,000

Chart 95B-4
Developer's Profit or Loss
After Reimbursement

Reimbursement (from Chart 95B-3)	$_____,000
Developer's share of interchange cost	$ 750,000
Developer's profit (or loss)	$_____,000
(Subtract interchange cost from reimbursement)	

Chart 95B-1
High Density Housing Site Needs

Housing Type	No. of Tracts to Be Developed	Site Needs	Sites Chosen	
			State Road	County Road
High Rise (60)	2	Tracts with one or more sides on a state or county road with hard soil.	_____	_____
Multi (35)	3	Tracts with one or more sides on a state or county road with either hard or firm soils.	_____	_____
Multi (15)	4	Tracts with one or more sides on a state or county road with either hard or firm soils.	_____	_____

Chart 95B-2
Developer's Profit or Loss

Housing Type	Tract No.	Average Land Cost/Tract	Construction Cost/Tract	Potential Sales Income/Tract	Unsold Tracts	Cost If Unsold Add land and const. cost
HR (60)		$1,200,000	$12,000,000	$18,000,000		
HR (60)		$1,200,000	$12,000,000	$18,000,000		
MF (35)		$ 350,000	$ 2,000,000	$ 3,000,000		
MF (35)		$ 350,000	$ 2,000,000	$ 3,000,000		
MF (35)		$ 350,000	$ 2,000,000	$ 3,000,000		
MF (15)		$ 300,000	$ 1,800,000	$ 2,700,000		
MF (15)		$ 300,000	$ 1,800,000	$ 2,700,000		
MF (15)		$ 300,000	$ 1,800,000	$ 2,700,000		
MF (15)		$ 300,000	$ 1,800,000	$ 2,700,000		
MF (15)		$ 300,000	$ 1,800,000	$ 2,700,000		
Subtotals		$4,650,000	$37,200,000	$55,800,000		
			+$ 4,650,000			
Total Development Cost →			$41,850,000	− $41,850,000		
				$13,950,000	Subtract Cost of Unsold Tracts	
				−$,000	←	
Total Developer's Profit (or loss) →				$,000		

ACTIVITY 96

The Economics of Community Development

Problem 1

To be completed by Ponderosa and Marion Team.

Objective

Using the Apollo County Map and Chart 96-1, figure the loss of money due to reduced employment at Sonic Jet.

Computing Loss—Reduced Employment

1. Refer to the large 4′ x 4′ Apollo County Map.
2. Find the total number of *SF, Multi, HR, Local Shopping* and *Central Business* tracts in the community.
3. Enter each of these totals in Chart 96-1. Check with other team members to assure that all members have the same numbers in Chart 96-1.
4. Multiply these numbers by the *amount* of money located in the "Loss/Tract" column to find the "Total Loss."
5. Add to find "Total Loss Due to Reduced Employment." Check your answer with other members.
6. When all team members have the same answer entered in Chart 96-1, your Team Captain should raise his hand.

Problem 2

To be completed by Salem and Ford Team.

Objective

Using the Apollo County Map and Chart 96-2, figure the loss of money due to loss of environmental value in Sonic City.

Computing Loss—Environmental Value

1. Look at all four townships. Find the total number of *SF, Multi,* and *HR* tracts *in the entire community* that border the railroad.
2. Enter this figure in Chart 96-2. Then find the total number of *SF, Multi, HR,* and *Local Shopping* tracts that border the sewage plant.

Chart 96-1

Loss Due to Reduced Employment (Ponderosa and Marion Team)

	No. of Tracts	Loss/Tract	Total Loss
Total Number of *SF* Tracts in Community		$ 100,000	$_____,000
Total Number of *Multi* Tracts in Community		$ 300,000	$_____,000
Total Number of *HR* Tracts in Community		$1,500,000	$_____,000
Total Number of *Local Shopping* Tracts in Community		$ 150,000	$_____,000
Total Number of *Central Business* Tracts in Community		$1,500,000	$_____,000
		Total Loss Due to Reduced Employment (add)	$_____,**000**

3. Enter this figure in Chart 96-3. Then find the total number of *SF*, *Multi*, *HR*, and *Local Shopping* tracts that border the Sonic Jet plant.
4. Enter this figure in Chart 96-2.
5. When all three figures have been entered in "Number of Tracts," check your answers with other team members to assure that all team members have the same numbers. Then multiply these numbers by the amount of money located in the "Loss/Tract" to find the "Total Loss."
6. Add the three "Total Loss" figures to find the "Total Loss Due to Loss of Environmental Value." Check your answer with other team members. When all team members have the same answer recorded in Chart 96-2, your Team Captain should raise his hand.

Chart 96-2

Loss Due to Loss of Environmental Value (Salem and Ford Team)

	No. of Tracts	Loss/Tract	Total Loss
Total Number of Tracts of *SF*, *Multi*, and *HR* Tracts that border the railroad		$ 80,000	$_____,000
Total Number of Tracts of *SF*, *Multi*, *HR*, and *Local Shopping* Tracts that border the sewage plant		$100,000	$_____,000
Total Number of Tracts of *SF*, *Multi*, *HR*, and *Local Shopping* Tracts that border the Sonic Jet plant		$ 80,000	$_____,000
		Total Loss Due to Loss of Environment Value (add)	$_____,**000**

Problem 3

Objective

Using the Apollo County Map and Charts 96-3 and 96-4, figure the total developers loss due to deterioration in Sonic City.

Chart 96-3

Total Community Deterioration Loss

Teams	Cause of Deteriorations	Total Loss
Ponderosa and Marion	Reduced Employment at Primary Construction	$____,000
Salem and Ford	Loss of Environmental Value	$____,000
	Loss of Locational Value	$2,400,000
	Total Community Deterioration Loss	$____,000

Chart 96-4

Developer's Deterioration Loss— _____Township

	No. of Tracts	Loss/Tract	Total Loss
Reduced Employment:			
Total number of *unsold* multi tracts in township.		$ 300,000	$_____,000
Total number of *unsold* HR tracts in township.		$1,500,000	$_____,000
Total number of *unsold* central business tracts in township.		$1,500,000	$_____,000
Loss of Environmental Value:			
Total number of *unsold* tracts of multi and HR housing that border a railroad.		$ 80,000	$_____,000
Total number of *unsold* tracts of multi and HR housing that border a sewer plant.		$ 100,000	$_____,000
Total number of *unsold* tracts of multi and HR housing that border the Sonic Jet Plant.		$ 80,000	$_____,000
Loss of Locational Value:			$ 80,000
		Total Developer's Loss Due to Deterioration (add)	$_____,000

Chart 96-5

Urban Development Project

Project	Tracts Required	Potential Construction Cost	Potential Income	Profit
Hospital	1	$ 5,500,000	$ 6,000,000	$ 500,000
City Hall	1	$ 2,000,000	$ 2,250,000	$ 250,000
Library	1	$ 1,500,000	$ 1,750,000	$ 250,000
Museum	1	$ 2,500,000	$ 2,750,000	$ 250,000
Community College	3	$12,000,000	$15,000,000	$3,000,000
Convention Center	2	$17,000,000	$18,000,000	$1,000,000
Stadium	3	$25,000,000	$30,000,000	$5,000,000
Industrial Plant	2	$ 3,000,000	$ 4,200,000	$1,200,000
Heliport (Small Airport)	3	$14,000,000	$17,000,000	$3,000,000
Amusement Park	2	$ 5,000,000	$ 6,500,000	$1,500,000
Office Building	2	$ 7,000,000	$ 9,200,000	$2,200,000
Drive-in (Movie)	1	$ 500,000	$ 750,000	$ 250,000
Rink (Ice or Roller)	1	$ 40,000	$ 50,000	$ 10,000
Others_____				

Problem 4

Objective

Using the Apollo County Map and Charts 96-5 and 96-6:

a. Identify an urban renewal project.
b. Select the site for the project.
c. List three reasons to justify the construction of the urban renewal project selected.

Urban Renewal

1. Complete the charts according to the teacher's instructions.

Chart 96-6
Effects of Urban Renewal

Tract Numbers	Name of Project(s) and Description	Reasons Project Will Help Sonic City	Profit
		1. _____	$_____,000
		2. _____	$_____,000
		3. _____	$_____,000
		Total Profit	$_____,000

ACTIVITY 97

Managing Community Development

Problem

Objective

Using charts from Activity 97, compute profit or loss from community planning practices.

Chart 97-1
Current Net Worth

Original Capital	$10,000,000
Total Developer's Profit or Loss (add profit, subtract loss)	_____,000
Total Developer's Cost (subtract)	_____,000
Current Net Worth	$_____,000

Chart 97-2
Summary Table and Winning Team

Team	Net Worth	Winning Team
Ponderosa	$_____,000	
Marion	$_____,000	
Ford	$_____,000	
Salem	$_____,000	

Chart 97-3

Developer's Cost, Profit and Loss Balance Sheet

Township

Activity	Description	Cost	Profit or Loss	
92	Developer's Share of Utility Costs			
93	Developer's Profit or Loss for SF Housing Development			
94	Developer's Profit or Loss from Central Business Development			
95	Developer's Cost for School Development			
95A	Developer's Cost for Park Development			
95B	Developer's Profit or Loss from High Density Housing			
95B	Developer's Profit or Loss from Interchange			
95B	Developer's Profit from Sale of Additional SF Housing Unit			
96	Developer's Loss Due to Deterioration			
96	Developer's Profit or Loss from Urban Renewal Project			

Total Cost	
Total Profit	
Total Loss	
	Total Profit
	Total Loss

1. Subtract "Total Loss" from "Total Profit" to determine if your development team received a *profit* or *loss* for their services. Record your *profit* or *loss* in Chart 97-1, Activity 97.

Activity Notes and Records

A McKNIGHT PUBLICATIO

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